

IMPROVING INCLUSIVE INSTRUCTION WITH ASSISTIVE TECHNOLOGY IN
ETHIOPIA AND EXPLORING INTERVENTION REPLICABILITY

by
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IMPROVING INCLUSIVE INSTRUCTION IN ETHIOPIA

Abstract

Improving access to and the quality of education for children with disabilities is a strategic priority for the Government of Ethiopia. In spite of inclusive education policies, enrollment of children with disabilities in public school is lagging. Notable factors that are associated with this problem in the East African region include poverty, limitations in the operationalization of national policies, traditional socio-cultural barriers and the stigma attached to disabilities, gaps in teacher professional development, and lack of specialized materials and resources. This dissertation introduces the ecological systems theory as a framework for the systematic analysis of the problem and draws on the theory of planned behavior as the conceptual underpinning of an intervention aimed at increasing teachers' adoption of inclusive instructional practices in regular reading classrooms. The intervention, adopting a convergent mixed methods research design, took place throughout 2016/2017 in 109 classrooms and 7 mother tongue languages across 5 regions of Ethiopia. Participating teachers engaged in a total of 4 days of in-service teacher training and then used accommodated multimedia lesson plans on smartphones. Teachers received 2 classroom visits for pedagogic support and feedback throughout the 3-month intervention. Study results indicated over 9% of children in participating classrooms had a potential hearing or vision impairment. Findings also suggested improvements in participating teachers' attitudes toward inclusive education, their self-efficacy, and their adoption of inclusive instructional practices. A unique contribution of this dissertation is a framework, with guiding questions to examine replicability of an intervention, proposed for further research and validation.

Keywords: inclusive education, Ethiopia, replicability, theory of planned behavior

Readers/advisors: Dr. Juliana Paré-Blagojev, Dr. Christine Eith, Dr. Maureen Black

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Preface

In spite of prevalent inclusive education strategies and a commitment to international agreements on inclusive education, governments often struggle to provide appropriate opportunities for children with disabilities to access quality education services (World Health Organization, 2011). In Ethiopia, the Ministry of Education (MOE) estimates the shortfall to include over 1.6 million children with disabilities who are not in school (MOE, 2016). This dissertation research was part of an assistive technology initiative aimed at addressing classroom-level barriers to quality inclusive education in Ethiopia. The dissertation author led the design and implementation of the assistive technology initiative under the auspices of the Reading for Ethiopia's Achievement Developed Technical Assistance project funded by the United States Agency for International Development and implemented by RTI International.

The dissertation author adopted the ecological systems theory (Bronfenbrenner, 1977) to help structure a comprehensive review of the literature examining the potential drivers of this problem (see Chapter 1). Research from the East African region thus indicated several barriers to inclusive education, including poverty (Mitra, Posarac, & Vick, 2013), limitations in the operationalization of national policies (Polat, 2011), and traditional socio-cultural barriers and the stigma attached to disabilities (Stone-MacDonald, 2012). Studies in this field also reported gaps in teacher professional development and support (Ojok & Wormnaes, 2013) as well as a lack of specialized materials and resources (Hofman & Kilimo, 2014). Furthermore, researchers suggested that, at the classroom level, challenges to quality education for children with disabilities include negative teacher attitudes and low self-efficacy for inclusion (Hofman & Kilimo, 2014).

A needs assessment (see Chapter 2) conducted as part of the assistive technology initiative suggested similar barriers in Ethiopia. Over 40% of the 109 participating teachers had

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never received any training on inclusion, and over 94% of teachers considered a lack of specialized instructional materials one of their biggest challenges to inclusive education. The needs assessment also found that participating teachers had modestly positive levels of attitudes toward and self-efficacy for teaching children with disabilities, yet results from classroom observations suggested a low adoption of inclusive practices. Results from screening over 3,725 students suggested a prevalence rate of 5.4% for vision impairment and 4.9% for hearing impairment.

The assistive technology initiative aimed to address a subset of these factors with the objective of improving teachers' adoption of inclusive instructional practices in regular reading classrooms in Ethiopia. The theory of planned behavior (Ajzen, 1991) served as a conceptual framework to illustrate the potential pathways by which teachers' instructional practices might be changed. To this effect, the theory of planned behavior highlights the role of teacher attitudes, subjective norms in their schools, teacher self-efficacy, and teachers' intentions as critical mechanisms in the process. Empirical studies addressing these variables (see Chapter 3) have suggested practical stand-alone teacher in-service training, implemented in several sessions over multiple weeks, as a viable approach to addressing a number of these factors in a diversity of contexts, including in low- and middle-income countries. This body of research, as well as evidence on effective teacher professional development (e.g., Desimone & Garet, 2015), informed the design and implementation of an intervention that focused on providing teachers with relevant knowledge, skills, materials, and support to increase their adoption of inclusive instructional practices.

The Ethiopia assistive technology initiative entailed four main components (see Chapter 4): (1) screening students for sensory impairments and informing teachers of their results, (2) teacher professional development (delivered as two 2-day teacher training events), (3)

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providing teachers with accommodated instructional materials (one headset and mobile phone per teacher with an app that included scripted lesson plans with accommodations for sensory impairments), and (4) two classroom monitoring visits over three months. The intervention engaged a total of 109 Grade 2 teachers in 63 public primary schools in five regions of Ethiopia, using a stratified sampling approach. The dissertation research explored to what degree participation in the intervention might improve teachers' attitude toward inclusive education, their self-efficacy for teaching students with sensory disabilities, and their adoption of inclusive instructional practices in regular reading classrooms.

The dissertation research adopted a convergent mixed method design to help evaluate the efficacy of the intervention. The convergent design allowed for a complementary integration of quantitative and qualitative data (Creswell & Plano Clark, 2011) to develop a more comprehensive picture of participating teachers' attitudes, beliefs, and behaviors. The research featured a pretest-posttest design with baseline data collection in advance of the intervention and endline data collection following three months of implementation. Commercially available, clinically validated mobile phone apps facilitated screening students for impairments.

Study findings from interviews with teachers suggested statistically significant ($p < .001$) improvements in participating teachers' attitudes toward inclusive education and in their self-efficacy for teaching students with sensory impairments. Responses indicated notable shifts in teachers' thinking about their ability to teach children with vision or hearing impairments and the value of these children's inclusion in regular classes. Results from classroom observations also indicated significant improvements in teachers' adoption of inclusive instructional practices. Such practices included writing lesson objectives on the board, repeating questions and students' responses, and ensuring that students were paying attention before lesson activities.

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A unique contribution of this dissertation, beyond insights into the prevalence of vision and hearing impairments in participating Ethiopian classrooms and the results of the assistive technology intervention, is the development and initial validation of a framework to explore intervention replicability (see Chapter 5). Building on elements and criteria from evaluability assessment (Strosberg & Wholey, 1985) and post-implementation reviews (Asian Development Bank, 2014; United Kingdom Department for International Development, 2011), this dissertation proposes an examination of replicability from six lenses: clarity of focus, plausibility, program success, utilizability, program cost, and sustainability. The dissertation author assesses each of these lenses via the example of the Ethiopia assistive technology initiative, confirms their relevance in examining intervention replicability, and recommends several guiding questions for each. The dissertation author also describes early replication efforts within and outside of Ethiopia.

This dissertation suggests that the Ethiopia assistive technology initiative not only resulted in measurable improvements in teachers' adoption of inclusive instructional practices but also shows promise for replicability. Tangible replication efforts in Ethiopia and elsewhere already taking place underscore a demand for reliable data and promising strategies to help improve access to and quality of education for children with disabilities in low- and middle-income countries, further advancing the global 2030 Sustainable Development Goals agenda.

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I could not have sustained the three-year journey of finalizing this dissertation and completing the Johns Hopkins Mind, Brain, and Teaching program without the help from many. Foremost, my thanks go to my family, especially my husband, Eloy, and my children, Naila and Liam, who have unwaveringly supported me in this effort, picked up the pieces where they fell, and believed in me. Over the years, they have also borne my many absences traveling to Ethiopia to oversee the implementation of the assistive technology initiative.

Instrumental in helping me complete this dissertation was also my advisor, Dr. Juliana Paré-Blagoev, whose ability to spot any opportunity to conceptually firm up an argument has been invaluable in strengthening my dissertation. I cannot thank her enough for her willingness to take me on as an advisee, her detailed feedback on the many pages of the dissertation, and her ability to always end our phone conversations leaving me excited about writing the next pages. Thanks also go to my committee members, Dr. Christine Eith and Dr. Maureen Black, whose advice and feedback during the proposal process, comprehensive exams, and dissertation defense deepened my learning and stretched my thinking.

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Three years ago, I was of the opinion I didn't need a study group to complete the comprehensive examinations and this program. I was wrong. I know better now. Kristin, Melissa,

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and Paula, thank you for allowing me to be in your midst. Our conversations and collaborative practice, but most of all our shared smiles and laughs, meant the world to me!

I also want to recognize my former READ TA colleagues in Ethiopia and the United States. Given the large scope of this activity, most of the over 60 staff on the project had been involved in the assistive technology initiative in some form, and their contributions were central to implementing the study. I also thank the participating school leaders, teachers, and students, as well as the assistive technology initiative working group members from the Ministry of Education, regional state education bureaus, colleges of teacher education, and national disabled persons organizations for their invaluable advice, active engagement, and commitment to this study in Ethiopia.

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Improving Inclusive Instruction With Assistive Technology in Ethiopia and Exploring Intervention Replicability

Primary school enrollment numbers for children who have disabilities and live in low- and middle-income countries are significantly lower than for children without disabilities in spite of prevalent inclusive education policies (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2016; World Health Organization [WHO], 2011). Notable factors that are associated with this problem include poverty (Mitra, Posarac, & Vick, 2013), limitations in the operationalization of national policies (Polat, 2011), traditional socio-cultural barriers and the stigma attached to disabilities (Stone-MacDonald, 2012), gaps in teacher professional development and support (Ojok & Wormnaes, 2013), and lack of specialized materials and resources (Hofman & Kilimo, 2014).

In Ethiopia, Berhane et al. (2008) found in a nationally representative study of 30,022 households that, among the entire sample of children and adults in the study, the national prevalence rate of low vision alone was 3.7% and for blindness 1.6%. However, for 2014/2015, the Government of Ethiopia reported that only 71,007 of children with disabilities (representing a calculated 0.38% of the gross enrollment) were enrolled in its primary schools (Ethiopia Ministry of Education [MOE], 2016a). These data indicate significant gaps in the enrollment of children with disabilities in Ethiopia's primary schools.

In addition to possible human rights concerns and the potential inability to reach agreed-upon social development goals by 2030 (United Nations [UN], 2015), there is an economic cost to exclusion. Not only are children with disabilities less likely to be in school, but individuals with disabilities are also less likely to be employed (Mitra et al., 2013). For the East African region, the International Labor Organization estimates the economic losses related to disabilities are between 3.5% and 5% of gross domestic product depending on country (Buckup, 2009).

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For this dissertation, inclusive education is defined as an approach that “seeks to address the learning needs of all children, youth and adults with a specific focus on those who are vulnerable to marginalisation and exclusion” (UNESCO, 2003, p. 4). Practically, inclusive education is understood as the integration of students with disabilities into regular classrooms for 80% or more of the school day. Disabilities are defined as “long-term physical, mental, intellectual or sensory impairments which, in interaction with various barriers, may hinder [individuals’] full and effective participation in society on an equal basis with others” (UN, 2006, p. 4).

This dissertation overlaps with work carried out under the auspices of the Reading for Ethiopia’s Achievement Developed Technical Assistance project funded by the United States Agency for International Development (USAID) and implemented by RTI International (RTI) from 2012 to 2018. Under the project, RTI implemented an assistive technology initiative aimed at improving teacher adoption of inclusive instructional practices in regular Grade 2 reading classrooms. The dissertation author led the design, implementation, and evaluation of this assistive technology initiative in Ethiopia. This dissertation extends previously reported findings by the dissertation author on behalf of RTI (RTI, 2017) with a comprehensive, theory-informed literature review (ecological systems theory; Bronfenbrenner, 1977). The dissertation also documents the study’s theory-based research and intervention design, analysis, and reporting (theory of planned behavior; Ajzen, 1991) for an international academic, practitioner, and policymaker audience.

Chapter 1 of this dissertation introduces ecological systems theory as a framework for the systematic analysis of the problem of low school enrollment of children with disabilities in low- and middle-income countries. Chapter 1 also documents the existing evidence base of the factors contributing to the low school enrollment of children with disabilities in these contexts through

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the lens of ecological systems theory. Chapter 2 outlines results from an empirical examination of these drivers and the underlying causes of the low school enrollment of children with disabilities specifically in the context of Ethiopia. Chapter 3 introduces the theory of planned behavior as the conceptual framework underpinning the overall assistive technology initiative, and Chapter 4 provides an in-depth discussion on the study design, methods, and sample. Chapter 5 uses the combined lens of post-implementation review and evaluability assessment to discuss the results of the intervention and to systematically analyze the intervention's potential for replication. Finally, the discussion in Chapter 5, which is a unique contribution of this dissertation, focuses on a framework for exploring replicability with guiding questions using six criteria proposed for further validation in future research: clarity of focus, plausibility, program success, utilizability, program cost, and sustainability.

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Chapter 1: Ecological Systems Theory as a Framework for Systematic Problem Analysis

In the late 1970s, Uri Bronfenbrenner developed and formulated ecological systems theory. The work was sparked by his growing concerns about what he perceived as the limited perspective that research was taking in describing processes of human development (Bronfenbrenner, 1979). Bronfenbrenner specifically noted the restricted focus on particular behaviors or unique situations rather than on more general human development within a larger societal context. He also noted that the research to date was limited to specific points in time; a more longer-term perspective, underpinning ecological systems theory, would result in an understanding of human development as a function of progressively maturing processes of interaction between a human being and its environment (Bronfenbrenner, 1977, 1979). Ecological systems theory also postulates that these processes vary as a direct function of individual human characteristics as well as the unique characteristics of the person's environment. Bronfenbrenner conceptualized the developing person at the heart of a nested set of systems that represent different environments of influence. Within this nested set of structures, Bronfenbrenner delineated various levels of systems based on their degree of proximity and direct interaction with the developing person. These nested structures are visualized as a set of concentric circles with the developing person at their center (Figure 1).

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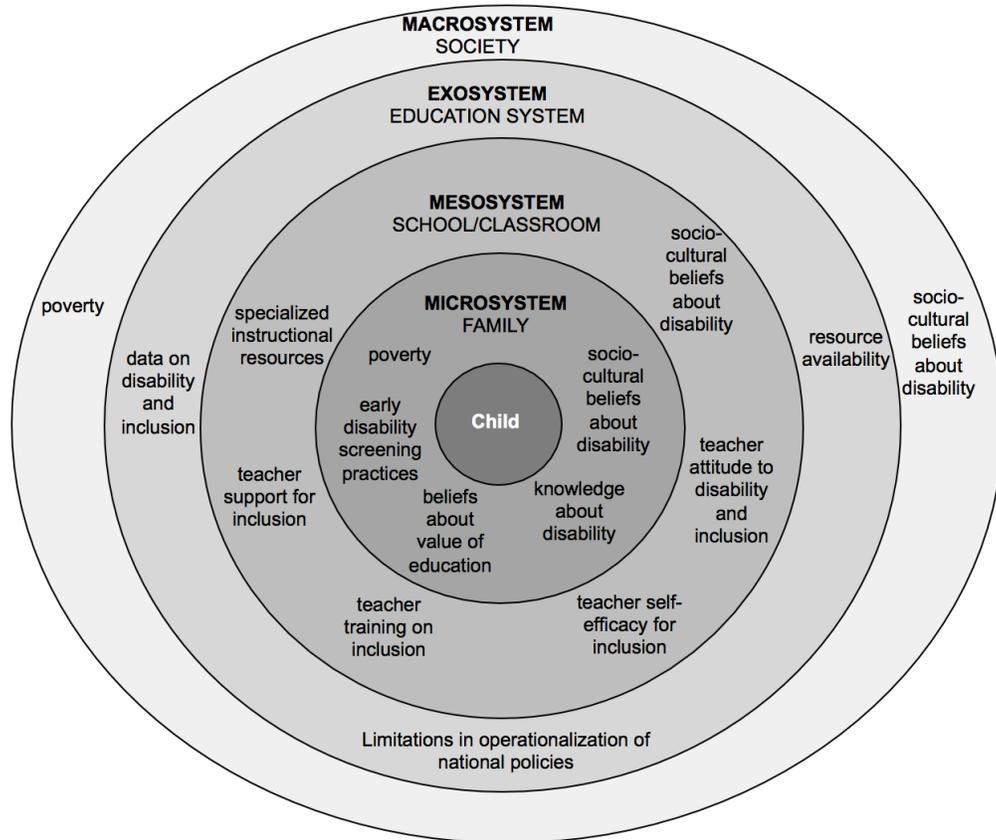


Figure 1. Barriers to inclusive education from the lens of ecological systems theory.

Bronfenbrenner (1977) labeled the most intimate setting, where the developing person may exercise and experience the most direct social interactions, the *microsystem*. One level removed, the *mesosystem* represents the setting that features interactions between actors or elements of the person’s microsystem (e.g., family members) with actors or elements of the person’s other environments (e.g., the classroom or workplace). The developing person’s microsystem is nested within the *exosystem*. Bronfenbrenner defined the exosystem as the setting not in which the developing person directly interacts, but in which actors, aspects, or events (e.g., policy changes) influence the person’s development. Finally, the outermost system is labeled the *macrosystem*. It represents wide-reaching cultural and societal actors, aspects, or events, including ideologies or the specific “organization of social institutions” (Bronfenbrenner, 1979,

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p. 8), that affect the individual developing person all through the three levels and settings inscribed within.

Ecological systems theory significantly changed the focus of much of the research on human development following the 1970s. The theory remains influential, through various stages of further development (e.g., the addition of a specific component of time, the *chronosystem*, to the framework and the defining properties of *process*, *context*, and *time* that resulted in the *bioecological system theory* in the early 2000s; Bronfenbrenner & Morris, 2006), in social science research to date. Therefore, ecological systems theory provides a relevant framework to examine the problem of low school enrollment of children with disabilities and its drivers, as illustrated in Figure 1.

As shown in Figure 1, barriers at the child's family level (microsystem) may include caregivers' beliefs about disability and their understanding of the value of schooling, as well as challenges they face due to poverty. Figure 1 also outlines barriers in the child's mesosystem, which encompasses the child's classroom and school environment. These barriers may include gaps in teacher professional development and scarcity of specialized instructional materials and resources. The exosystem perspective on the problem of low school enrollment highlights aspects of the larger education system environment, including applicable education policies that affect the child's schooling experience. A notable barrier at this level may include limitations in the operationalization of inclusive education policies. Finally, as Figure 1 indicates, factors at the macrosystem level may include larger socio-cultural challenges, such as the stigma attached to disability and general aspects of poverty and low income.

The next section presents the empirical and contextual evidence for the drivers of low school enrollment of children with disabilities in the East African region, particularly in Ethiopia. The section is organized along the four levels of the ecological systems theory, starting from the

child’s microsystem. This synthesis of the research literature also highlights interactions and relationships between factors and systems where established in the literature.

Drivers of Low School Enrollment at the Family Level

Figure 2 highlights drivers of low school enrollment at the family level, which, from an ecological systems theory perspective, constitutes the child’s microsystem. According to the literature discussed in more detail in this section, these factors include barriers due to parental beliefs and parents’ lack of knowledge about disabilities and early screening. Parents also may lack knowledge about the value of education for a child with an impairment. A notable barrier to school enrollment for children with disabilities in low- and middle-income contexts includes family poverty.

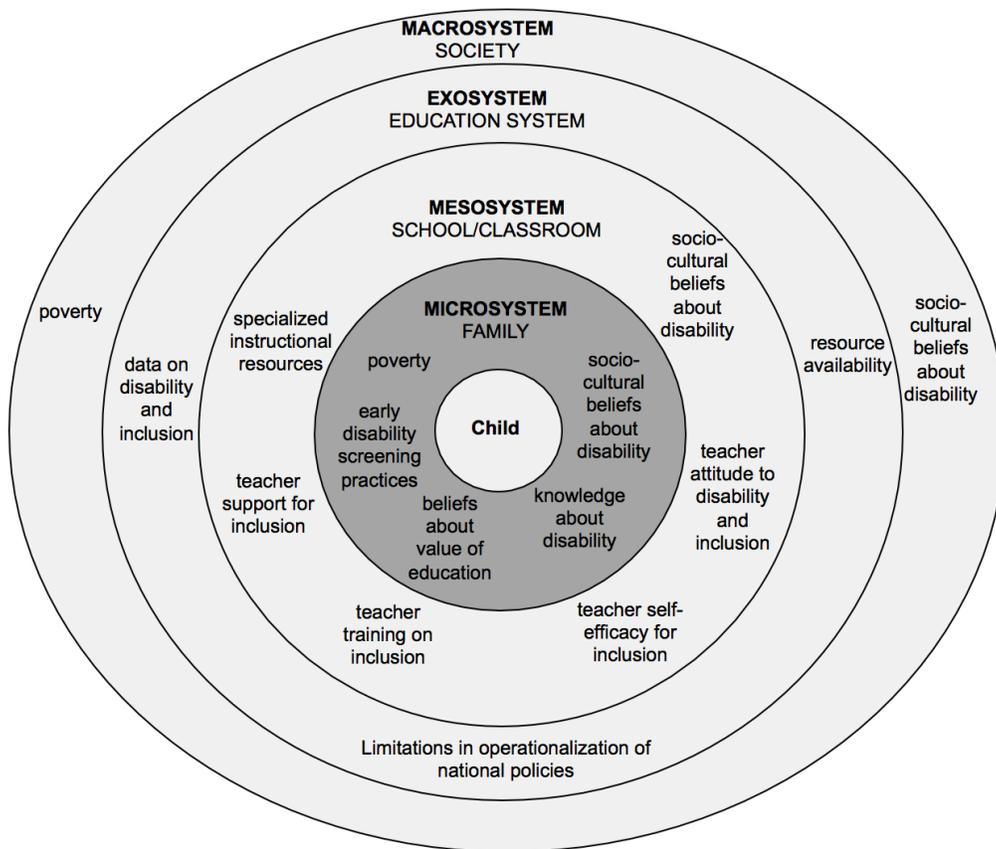


Figure 2. Drivers of low school enrollment at the microsystem (family) level.

Barriers Due to Parents' Beliefs and Lack of Knowledge About Disabilities

At the family level, socio-cultural factors like parental beliefs, attitudes, and expectations play an important role in the demand for, and implementation of, inclusive education in East Africa (Karangwa, Miles, & Lewis, 2010; Stone-MacDonald, 2012). In the East African region, families caring for a child with a disability often feel shame (Boersma, 2008; Kurtz & Shepherd, 2011; Tilahun et al., 2016), do not participate in common social activities (Weldeab & Opdal, 2007), experience fear of being treated differently by their communities, or worry about not being accepted as a family to marry into (Tilahun et al., 2016). Research also indicates that the practice of keeping children with disabilities hidden in their homes is still prevalent (Franck & Joshi, 2016; Kurtz & Shepherd, 2011), although some researchers report an increase in societal rejection of this custom (Stone-MacDonald, 2012). Boersma (2008) also suggests an indication that this practice may have, at least in part, its origin in parents' desire to protect their children from maltreatment and violence outside their homes.

Parents' level of information about their child's disability seems to play a role in shaping their beliefs and attitudes toward disabilities. Particularly when the cause of disability is unclear, concepts of disability as a sin, curse, or part of God's plan are still prevalent in East Africa (Kurtz & Shepherd, 2011; Stone-MacDonald, 2012). In a study with a convenience sample of 126 parents in Tanzania, 41% of participants were aware of what caused their child's disability, whereas over half of them were not (Tungaraza, 2012). In addition to these gaps in knowledge about the nature of their child's disability, the next section summarizes evidence of parents' knowledge gaps regarding the value of education for a child with a disability.

Gaps in Parents' Knowledge About the Value of Education

Research suggests that not only beliefs or stigma are barriers to school enrollment of children with disabilities, but also lack of parental knowledge about the value of education might

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play a role (Arbeiter & Hartley, 2002; Boersma, 2008; Franck & Joshi, 2016; Stone-MacDonald, 2012). Illustratively, drawing on results from their ethnographic study in Ethiopia, Franck and Joshi (2016) report about one school director who initially paid the transportation costs for a student with a disability to allow the family to experience how school attendance could positively affect their child. The parents took on those costs after just a few days.

Researchers also note that parents raising children with a disability in Ethiopia might lack awareness about their children's ability and capacity to learn as well as successfully educated persons with disabilities who can serve as role models (Boersma, 2008; Franck & Joshi, 2016; Weldeab & Opdal, 2007). Although appropriate education opportunities are cited by caregivers as their most common unmet need (Tilahun et al., 2016), research has also revealed a lack of information among parents about the child's right to education in the local public school (Franck & Joshi, 2016). This lack of information presents barriers for parents to demand enrollment and education service provision. Parents who are willing and want to educate their children with disabilities are struggling with additional challenges, including a lack of concrete solutions to better meet the needs of their children (Weldeab & Opdal, 2007). One parent in Weldeab and Opdal's (2007) qualitative study in Ethiopia indicated that the "teachers are always telling me that she has a problem. I know she has a problem; the only thing that I do not know is the solution" (p. 8). As the next section outlines, there are also resource challenges related to the low school enrollment of children with disabilities at the family level.

Family Poverty and Resource Deprivation

From a materials and resource perspective, educating a child with a disability comes at a cost. Parents are often expected to financially contribute to the school (Karangwa et al., 2010) and may not be able to afford the purchase of the special equipment or materials needed (Mnyanyi, 2009; Okongo, Ngao, Rop, & Nyongesa, 2015). Furthermore, in the East African

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region, the leading causes of disability are malaria, meningitis, and measles, as well as complications before, during, and after birth (Kello & Gilbert, 2003; Tungaraza, 2012), causes that are often preventable through medication, immunization, and proper health care (Kello & Gilbert, 2003; Tungaraza, 2012) as well as early age screening for disability (Geda, Berhane, Assefa, & Worku, 2016). Parents' struggle to meet the cost of these services highlights the overall link between poverty and disability (Nyeris & Koross, 2015; Polat, 2011; Tungaraza, 2012).

In summary, parents caring for a child with disabilities in East Africa do not always know of their child's right to education. They are not fully informed of their child's disability and the child's potential to learn, and they lack access to information and concrete solutions for better support. Poverty and lack of access to specialized materials are additional barriers at that level. The current empirical evidence indicates that these gaps in information, knowledge, and resources might play a role in the low enrollment of children with disabilities in regular public schools. The next section explores the factors influencing low enrollment of children with disabilities at the school level.

Drivers of Low School Enrollment at the School Level

Figure 3 highlights drivers of low school enrollment at the school level, which, from an ecological systems theory perspective, constitutes the child's mesosystem. From the literature, discussed in more detail in this section, these factors include socio-cultural beliefs and attitudes among teachers and students and gaps in teacher professional development and support. Barriers also stem from limitations in teachers' self-efficacy and the lack of specialized resources and materials to support inclusive education.

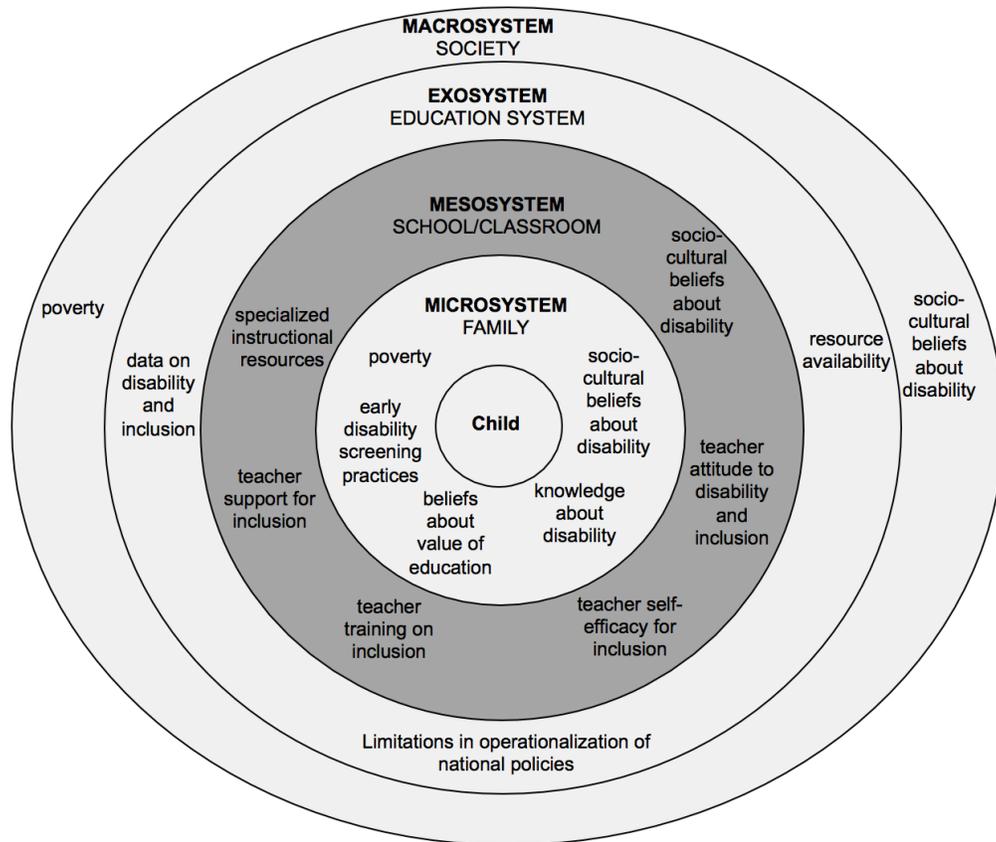


Figure 3. Drivers of low school enrollment at the mesosystem (school) level.

Socio-cultural Barriers Among Teachers and Students

At the school level, enrollment and quality education for children with disabilities are affected by socio-cultural issues of teacher attitudes and self-efficacy (Arbeiter & Hartley, 2002; Hofman & Kilimo, 2014; Malinen et al., 2013; Sharma, Loeman, & Forlin, 2012). Research specifically on teacher attitudes toward inclusive education in the region, however, is inconclusive. In a recent study with 100 teachers selected by convenience from 10 schools in Tanzania, Hofman and Kilimo (2014) found that teachers had a slightly negative attitude toward children with disabilities in their classrooms. In contrast, interviews and observations with a convenience sample of 28 teachers from three schools in Uganda (Arbeiter & Hartley, 2002) and 60 teachers from four schools in Ethiopia (Dagnew, 2013) indicated that teachers exhibited positive attitudes toward inclusive education and students with disabilities. Aside from the

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possibility of true variance in attitudes toward disability among teachers participating in these different studies (especially given that none included a nationally representative sample), contrasting findings may also be the result of differences in study design, instrumentation, and the operationalization of attitudes as a concept. Illustratively, Hofman and Kilimo (2014), developed and used a 20-item scale with 5-point Likert response options to collect their data on teacher attitudes, whereas Arbeiter and Hartley (2002) collected their data predominantly through qualitative methods using semi-structured interviews, focus groups, and classroom observations. These differences in data collection may contribute to varying results.

Research on predictors of teachers' attitudes toward inclusive education is similarly ambivalent, even within individual studies. Hofman and Kilimo (2014), in their quantitative data analysis using multiple regression models with data from an attitude scale, found that variables such as gender, class size, type of disability, or special needs training had no significant relationship to teacher attitudes. At the same time, large class sizes and lack of special needs training (together with a lack of resources and materials) were among the most cited barriers to implementing inclusive education by the participating teachers. These qualitative results are comparable to those of other studies in Africa that identified large class sizes and lack of teacher training as negative contributors to teacher attitudes toward inclusive education (Arbeiter & Hartley, 2002; Maunganidze, Kasayira, Ruhode, Shonhiwa, & Sodi, 2007; Mnyanyi, 2009). In addition, teacher self-efficacy, general work experience, work experience specifically with children with disabilities, and age, have been identified as contributors of positive attitudes toward inclusive education in the larger African region (Arbeiter & Hartley, 2002; Hofman & Kilimo, 2014; Maunganidze et al., 2007).

Teachers in the East African region also report feelings of fear, shock, and disapproval, particularly toward teaching children with more severe disabilities (Arbeiter & Hartley, 2002;

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Karangwa et al., 2010). These feelings are often related to a lack of information about specific disabilities and illnesses among teachers and the larger school community (Gebrewold, Enquselassie, Teklehaimanot, & Gugssa, 2016; Tekle-Haimanot et al., 2016). In Ethiopia, Gebrewold et al. (2016) found that, in research on the knowledge, attitudes, and practices of Ethiopian teachers toward children with epilepsy, nearly 9% of the 1,699 participating teachers believed that epilepsy is caused by a curse from God, an evil spirit, or witchcraft. Also in Ethiopia, Tekle-Haimanot et al. (2016) found that, in research with 226 high school students, over 40% of participating students from rural schools believed that epilepsy was contagious, and half of the students in the urban schools were not sure about this fact. Ignorance might thus play a role in the formation of negative attitudes and the perpetuation of myths about disabilities. As the next section outlines, however, socio-cultural barriers are not the only obstacles to inclusive education at this mesosystem level. The evidence points to significant challenges also with teachers' professional development and support for implementing inclusive education in the East African region.

Gaps in Teacher Professional Development and Support

Teachers in East Africa note a significant gap in their professional development and instructional support regarding teaching children with disabilities in their mainstream classrooms. Large proportions of teachers, participating in various studies across the region, claim to have never received any specialized training or professional development on the topic (Arbeiter & Hartley, 2002; Franck & Joshi, 2016; Hofman & Kilimo, 2014; Kristensen, Omagor-Loican, Onen, & Okot, 2006). Teachers particularly experience gaps in turning theoretical knowledge of inclusive strategies into practice (Arbeiter & Hartley, 2002; Hofman & Kilimo, 2014; Tungaraza, 2014; Westbrook & Croft, 2015). Teachers can often cite specific strategies for accommodating children with disabilities but are struggling to implement these in their

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instruction (Arbeiter & Hartley, 2002; Kristensen et al., 2006). Classroom observations indicate that instruction in inclusive classrooms in East Africa is predominantly teacher centered, with students responding and engaging mostly in choral format, with little attention to individual children, and few—if any—actual accommodations or coping mechanisms (e.g., repetition, extra time, sign language/braille, or alternative materials or activities for the children with disabilities) implemented (Arbeiter & Hartley, 2002; Kristensen et al., 2006).

Even in the absence of students with special needs in classrooms, foundational aspects of student-centered, constructivist teaching and learning strategies are not prevalent in East African schools (Frost & Little, 2014; Hardman, Abd-Kadir, & Tibuhinda, 2012; Vavrus, 2009).

Instruction in those classrooms shows little student individual or group work, features teachers asking predominantly recall questions rather than open questions triggering discussion and elaboration, and includes few incidences of students asking questions themselves (Frost & Little, 2014; Hardman et al., 2012). This form of instruction might lead to a “perpetuation of a restrictive, often monotonous, model of teaching and learning” (Hardman et al., 2012, p. 829). Vavrus’s (2009) ethnographic study of constructivist pedagogies in Tanzania also found that the six teacher participants struggled to enact knowledge of specific instructional approaches they learned during their pre-service training. The author concluded that, “in this era of advocacy for social constructivist approaches in Africa, it is critical that policy makers recognize that the examination system, the material infrastructure of schools, and the length and the quality of teacher education programs limit the likelihood of a fundamental shift from formalism to constructivism” (p. 309).

In addition, existing teacher support systems for inclusive education, for example, through itinerant teachers, are not sufficiently developed and funded to provide practical support (Franck & Joshi, 2016; Lynch, McCall, Douglas, McLinden, et al., 2011; Lynch, McCall,

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Douglas, McLinden, & Bayo, 2011). Itinerant teachers are teachers who are assigned to several schools, which they regularly visit in support of children with disabilities (Wapling, 2016). Researchers in East Africa found that itinerant teachers are few and visit inclusive classrooms only sporadically. Furthermore, itinerant teachers may suboptimally trained themselves, experiencing a high workload, and struggling with a lack of formal guidance as to what is expected of their role (Franck & Joshi, 2016; Lynch, McCall, Douglas, McLinden, et al., 2011; Lynch, McCall, Douglas, McLinden, & Bayo, 2011). Based on their ethnographic research in Ethiopia, Franck and Joshi (2016) indicated that the way the itinerant teacher system is currently implemented may inadvertently lead to reduced engagement of non-itinerant teachers by placing sole educational responsibility for children with disabilities on the itinerant teacher. Franck and Joshi (2016) also highlighted that participating teachers believed inclusive education to be understood only from a lens of disability and have not yet adopted inclusion as an approach that can benefit all classroom students through flexible curricula, varied assessments, and diverse instructional strategies.

Concerning the benefit of inclusion for all children, researchers studying higher-income countries have found mostly positive, although at times mixed results (depending on disability type, severity, and specific inclusion model), academic and socio-emotional indicators for students with and without disabilities in inclusive settings (Fredrickson, Simmonds, Evans, & Soulsby, 2007; Gruner Gandhi, 2007; Ruijs, Van der Veen, & Peetsma, 2010; Szumski & Karwowski, 2014; Wiener & Tardif, 2004). Such research, however, is largely missing for the East African region—and low- and middle-income countries more broadly (Wapling, 2016).

For the East African region, these findings on the divide between theory and practice underscore the scope of the challenge of moving from a predominantly teacher-centered model of instruction to a student-centered one that effectively meets the individual needs of students

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with disabilities, as envisioned in the 1994 *Salamanca Statement and Framework for Action on Special Needs Education* ratified by nearly 100 participating governments, including Ethiopia (UNESCO, 1994). Research indicates that teacher self-efficacy, their confidence in creating and managing inclusive classrooms, might be a key factor in the “march toward inclusive education” (Tungaraza, 2014, p. 109).

Limitations of Teacher Self-Efficacy for Inclusive Education

Researchers studying inclusive education and teachers often raise the concepts of self-efficacy and teachers’ willingness to adopt instructional innovations. These studies have predominantly been undertaken in higher-income countries (Malinen et al., 2013; MacFarlane & Woolfson, 2013; Salovitta, 2015; Sharma et al., 2012; Soodak, Podell, & Lehman, 1998; Vaz et al., 2015; Wapling, 2016). There are few studies on teacher self-efficacy for inclusive education from East Africa, and none from Ethiopia to date. Researchers studying higher-income countries have found that teachers with high self-efficacy have more positive attitudes toward inclusive education because they also tend to be more confident in their classroom management strategies, differentiation practices, and better able to cope with challenges (Soodak et al., 1998; Vaz et al., 2015).

In East Africa, studies on teacher self-efficacy and willingness to accommodate the inclusion of children with a disability indicate that teachers tend to be slightly positive in their disposition to organize and manage inclusive instruction (Hofman & Kilimo, 2014; Ojok & Wormnaes, 2013). In Tanzania, Hofman and Kilimo (2014) found that, among the 100 participating teachers in their study, teachers had a moderate sense of self-efficacy for teaching in inclusive classrooms. Notably, variables such as gender, class size, or special needs training had no significant relationship to teacher self-efficacy. Teacher attitude and self-efficacy, however, were related significantly, and positively. This relationship between teacher attitude and self-

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efficacy is supported by research also in other country contexts (Emam & Mohamed, 2011; Savolainen, Engelbrecht, Nel, & Malinen, 2012; Weisel & Dror, 2006). Furthermore, teacher work experience with children with disabilities was also positively and significantly related to teacher self-efficacy (Hofman & Kilimo, 2014). Researchers in Egypt and South Africa drew similar conclusions (Emam & Mohamed, 2011; Malinen et al., 2013). Aside from teacher professional development, teacher support, and teacher self-efficacy, research overwhelmingly points to a lack of specialized instructional materials and resources available as a primary challenge in implementing inclusive education in East Africa.

Lack of Specialized Instructional Materials and Resources

Across studies and countries, the lack of specialized instructional materials and resources is one of the most prominently cited barriers to inclusive instruction (Arbeiter & Hartley, 2002; Boersma, 2008; Franck & Joshi, 2016; Hofman & Kilimo, 2014; Mnyanyi, 2009; Westbook & Croft, 2015). These studies highlight the dearth of even the most basic instructional items including pencils, exercise books, and textbooks in schools. Furthermore, researchers note the absence of specialized materials including large-print books, adapted books, braille readers, magnifying glasses, and slates and styluses in most mainstream classrooms (Arbeiter & Hartley, 2002; Dagne, 2013; Franck & Joshi, 2016; Polat, 2011; Westbook & Croft, 2015). School infrastructure across East Africa is poor, lacking accessibility features (e.g., ramps), latrines, safe water sources, tables and chairs, and making classrooms and school grounds difficult to navigate especially for children with disabilities (Boersma, 2008; Dagne, 2013; Kristensen, Omagor-Loican, & Onen, 2003; Kristensen et al., 2006; Polat, 2011; Tungaraza, 2014).

Schools in East Africa also lack access to screening tools and experience in their use to help identify possible impairments (Kristensen et al., 2006; Lynch, McCall, Douglas, McLinden, & Bayo, 2011). Researchers of existing studies point to the critical role itinerant teachers hold in

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conducting screening activities, but also note the limitations of this approach due to their small number and high workload, resulting in infrequent visits to schools (Lynch, McCall, Douglas, McLinden, et al., 2011; Lynch, McCall, Douglas, McLinden, & Bayo, 2011).

In summary, teachers have limited practical experience with students with disabilities in their classrooms. Furthermore, large proportions of teachers have never received any specialized training or support in inclusive education. These challenges contribute to negative or only marginally positive attitudes toward inclusive education and teacher self-efficacy. In an environment marked by those barriers, Karawanga et al. (2010), in their study in Rwanda, found that students may be welcome in the schools yet expected to adapt to the school and its environment. These findings highlight that, although children with disabilities might attend school physically, actual inclusion might not take place. Although no studies were found to document a causal linkage between this *instructional exclusion* and low school participation of students with disabilities, the existing data indicate particularly high dropout rates among children with disabilities (Moyi, 2013; WHO, 2011). High dropout rates are, in turn, common contributors to the low school enrollment of children—even those without disabilities—in East Africa and in Ethiopia particularly (MOE, 2016b). The next section discusses the drivers of low school enrollment at the education system level, as identified in the literature to date.

Drivers of Low School Enrollment at the Education System Level

Figure 4 highlights drivers of low school enrollment at the education system level, which, from an ecological systems theory perspective, constitutes the child's exosystem. Based on the literature discussed in this section, these factors include general resource limitations in the education system at large and in funding inclusive education policies in particular. Barriers also include limitations in the operationalization of inclusive education policies where they exist. Researchers further highlight barriers to quality inclusive education stemming from a lack of

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relevant data on disability and inclusion available at the education system level to inform policy and practice.

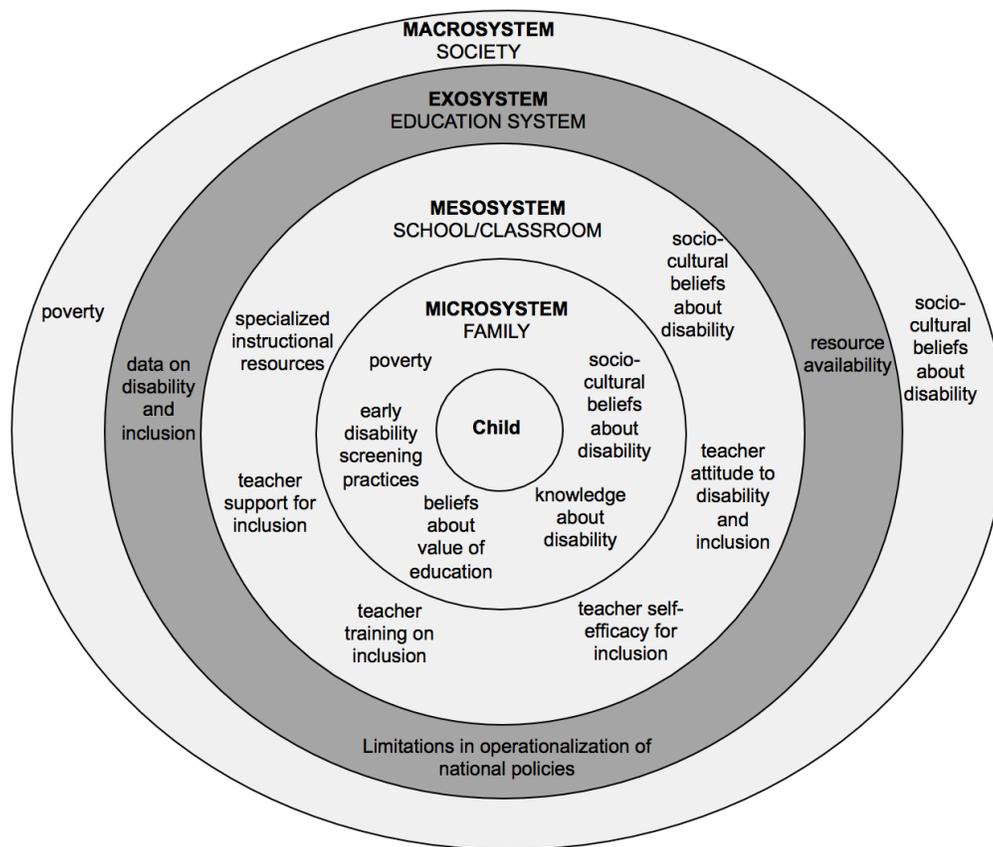


Figure 4. Drivers of low school enrollment at the exosystem (education system) level.

Limitations in the Operationalization of National Policies

National policies and strategies in support of inclusive education have been widely adopted in the East African region, especially since the 1994 *Salamanca Statement and Framework on Special Needs Education* ratification. Indicatively, Kenya adopted the *Persons with Disability Act* in 2003, a national special needs education policy framework in 2009, and specific constitutional rights for persons with disabilities regarding access to facilities, adaptive equipment, and tools for education in 2010 (Malle, 2016). Tanzania has had a national policy on disability since 2004, outlining the responsibility of the government to provide a conducive environment for inclusive education, and a national strategy on inclusive education since 2009

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(Malle, 2016). Ethiopia mentioned the right to special education for people with special needs in its *1994 Education and Training Policy* (Federal Democratic Republic Government of Ethiopia, 1994), which contributed to the establishment of special classes for learners with disabilities in regular public schools, complementing an existing small number of special schools often run and managed by non-governmental actors (Temesgen, 2014). The country has also had special needs education strategies in place since 2006, the most current from 2016 (Malle, Pirttimaa, & Saloviita, 2015; MOE, 2016b). In addition, education sector development and improvement plans have included increasingly ambitious targets for inclusion over the years (Graham, 2015).

Research on these inclusive education policies and strategies, however, highlights shortcomings in their development and operationalization processes. Researchers have found that disabled persons organizations have often had little influence on national inclusive education policies (Malle, 2016; Malle et al., 2015). Policy commitments and funding are also not sufficient to promote equity (Malle, 2016; Malle et al., 2015; Polat, 2011). Where there are policy provisions, (e.g., special funds for students with disabilities), researchers suggest that school principals and local education officials may not know how to access them (Elder, Damiani, & Oswago, 2016).

Inclusive education policies may also lack clear alignment with and systematic consideration of students with disabilities in core elements such as curriculum and assessment (Malle et al., 2015). The challenges faced by itinerant teachers are indicative of the shortcomings in the clarity on the concept of inclusive education, in the clarity on the operationalization of its implementation, and of related resource allocations (Franck & Joshi, 2016; Lynch, McCall, Douglas, McLinden, et al., 2011; Lynch, McCall, Douglas, McLinden, & Bayo, 2011). Furthermore, study results indicate a lack of research and evidence to inform policymaking and strategies on the actual situation in schools and communities (Malle et al., 2015; McLachlan et

al., 2014). This lack of data and reliable evidence related to disabilities and inclusive education is prevalent across the East African region, as outlined in the next section.

Absence of Data on Disability and Inclusive Education

Research across the East African region highlights the lack of empirical evidence on many of the student-level issues and factors related to inclusive education including the prevalence of disabilities. Specific data deficits exist on enrollment, academic achievement, and social and affective outcomes of inclusive education for students with disabilities (Arbeiter & Hartley, 2002; Banks & Polack, 2014; Filmer, 2008; Wapling, 2016). In the 2011 *World Report on Disabilities*, the WHO highlights the challenges with prevalence data on disabilities, stating problems with the standardization of definitions and categorizations. These differences in classifications might also be derived from differences in data collection tools.

Illustratively, Geda et al.'s (2016) household survey of 21,572 households in the Kersa district of the Oromia region in Ethiopia used an adapted form of the UNICEF “ten questions (TQs)” (p. 2) and “Washington Group Short Set questions” (p. 2) instruments. The TQ has been used in other countries, including Kenya, and has shown to be reliable in detecting moderate to severe forms of disability (Mung’ala-Odera et al., 2004). In the Geda et al. (2016) study, the instrument was administered orally to caregivers of children aged 0–14 in the participating households by hired data collectors. The items screened for a wide range of disabilities, including sensory, intellectual, and physical disabilities. The researchers found that 2.7% of children aged 0–14 years were living with a disability, of which hearing impairment was the most prevalent (1.94%), followed by vision impairment (0.38%).

In contrast, in a nationally representative household survey specifically on blindness and low vision, conducted with 30,022 participants in 2005 in Ethiopia, Berhane et al. (2008) employed designated ophthalmic nurses and ophthalmologists for data collection. The

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instruments used for this study included a validated LogMAR chart with five letters per line, each letter being a tumbling E optotype. Additional eye examinations were conducted for study participants identified with low vision or blindness. Findings indicated a national prevalence rate of low vision of 3.7% and a national prevalence rate of blindness of 1.6%—much higher than the data collected by Geda et al. (2016).

The lack of reliable data on prevalence rates is not only caused by challenges with the standardization of instruments and classifications but is also due to the absence of systematic early disability screening in the region (Geda et al., 2016; Tamrat, Kebede, Alemu, & Moore, 2001; Tungaraza, 2012). These data gaps limit the region’s access to reliable records on the school enrollment of students with disabilities. As reported in the country’s annual education statistics, the Ethiopia MOE recognizes this deficit on reliable information, highlighting that “when interpreting this data [especially on enrollment] it should be noted that the understanding of disability and special needs within the education system is an evolving area and it is likely that some children with special needs have not been recorded in the data” (MOE, 2016a, p. 103).

Data on student academic achievement and social and affective outcomes in inclusive education settings are even more limited. In a recent systematic review of the literature on the quality of inclusive education in low- and middle-income countries, Wapling (2016) highlighted the absence of data on enrollment and educational performance of children with disabilities in regular and special schools. Wapling (2016) concluded that the existing body of research on inclusive education does not yet provide sufficient evidence as to what interventions may be most effective in supporting the educational achievement of children with disabilities. Notably, in the 131 articles reviewed, only one study included academic attainment data for students with disabilities (Wapling, 2016).

The next section outlines the existing empirical evidence on drivers of low school enrollment of children with disabilities at the societal level. The section also draws attention to the links between socio-cultural factors at the family, school, and society levels, as well as the reciprocal relationship between disability and poverty.

Drivers of Low School Enrollment at the Societal Level

Figure 5 highlights drivers of low school enrollment at the societal level, which, from an ecological systems theory perspective, constitutes the child’s macrosystem. Based on the literature discussed in more detail in this section, these factors include socio-cultural norms that present barriers to inclusion as well as poverty.

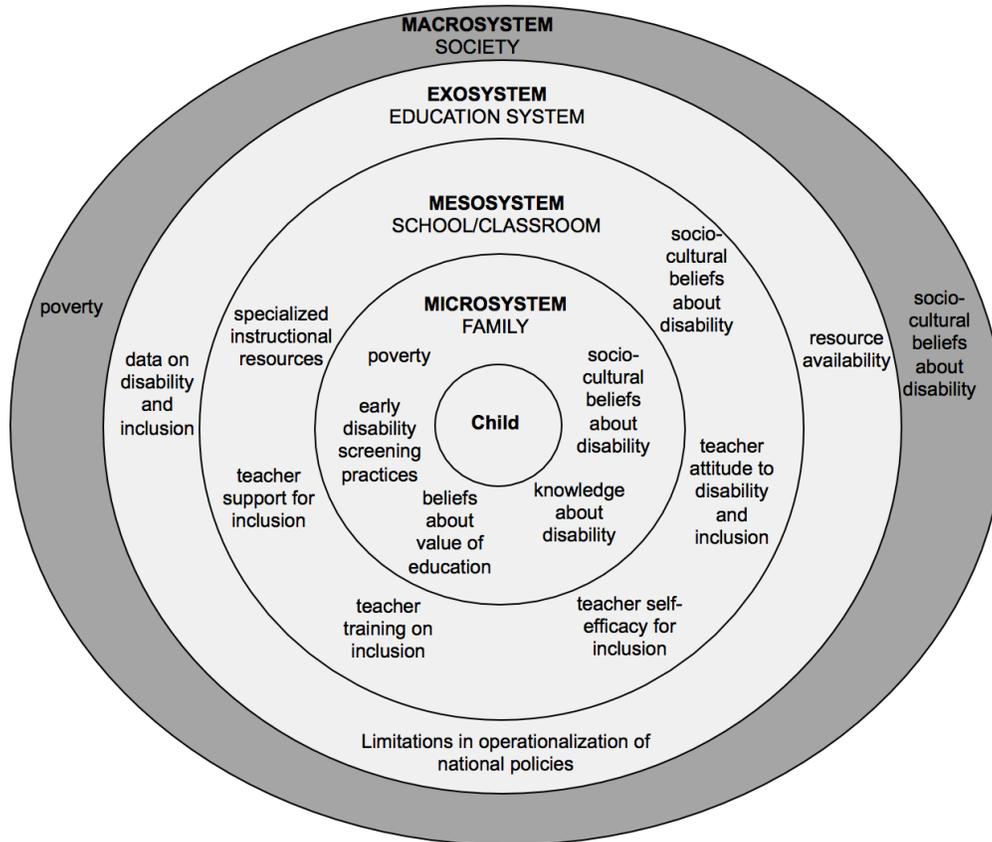


Figure 5. Drivers of low school enrollment at the macrosystem (societal) level.

Socio-cultural Barriers and Societal Norms

Negative attitudes and socio-cultural barriers at the family and school level are also prevailing at the societal level across East Africa, highlighting the interrelatedness of families' beliefs and decisions with their communities' values (Karangwa et al., 2010; Tilahun et al., 2016). Notably, Karawanga et al. (2010) concluded from their ethnographic study in Rwanda that there was a strong connection between how children with disabilities were treated in their communities and how they were regarded in school. Communities across the region consider disability a sin, curse, or punishment from God, and believe that it is caused by an evil spirit or witchcraft (Boersma, 2008; Franck & Joshi, 2016; Gebrewold et al., 2016; Girma et al., 2013; Kurtz & Shepherd, 2011; Polat, 2011; Stone-MacDonald, 2012). Such negative sentiments are often expressed in the use of derogatory language with and about persons with disabilities (Boersma, 2008; Karangwa et al., 2010; Malle et al., 2015; Polat, 2011). For example, an Ethiopian parent revealed that her son with a mental disability was often made fun of and labeled "Mama Killo (a legendary figure in Ethiopia known for his foolish deeds)" (Weldeab & Opdal, 2007, p. 8). Furthermore, Boersma (2008) noted a lack of recognition among community members of the possible mutual benefit of educating children with a disability to society at large. Families, particularly considering scarce resources, favored investment in education for the child who has the most chances for gainful employment. This favoritism might stem from the expectation that parents in Ethiopia depend on their children's ability to take care of them when they are old (Franck & Joshi, 2016).

Boersma (2008) raised violence against children with disabilities as an additional issue that combines aspects of attitude and cultural norms at the societal level. In interviews, caregivers of children with disabilities explained that they locked their children in the house and prevented them from going to school to protect them from violence. Given the vulnerability of

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children with disabilities to abuse, “by trying to shield their children from violence, parents sometimes violate the rights of their own children” (Boersma, 2008, p. 37). In also capturing directly the voices of children with disabilities who have become victims of violence, Boersma (2008) revealed that the account of the victims often is not taken seriously, that victims are asked to be quiet about what happened, and that they stand little chance of community protection or legal justice. Boersma (2008) noted that these accounts might be indicative of a lack of “social capital” (p. 47) aggravated by unequal system-level resource investments in these children’s education and development.

In sum, socio-cultural barriers, prevalent cultural norms around reciprocity, and beliefs about low returns on investment for education, coupled with low social capital for their protection and equity, provide significant barriers to enrollment for children with disabilities at the societal level. There is also an emphasis in the literature on the central role of poverty in the low education attainment of persons with disabilities, as outlined in the next section.

Societal Poverty

Results from studies across low- and middle-income countries establishes a robust relationship between poverty and disability (Filmer, 2008; Geda et al., 2016; Hosseinpoor et al., 2013; Kuper et al., 2008; Mitra et al., 2013). In a systematic review of 97 qualifying studies on disability and poverty covering the years since 1990, Banks and Polack (2014) established that 80% of the studies under investigation reported a positive, statistically significant relationship between disability and poverty. This association held across study designs and potentially confounding factors such as age, geography, and disability types. Illustratively, study results in the East African region indicate that poorer households are less likely to get antimalarial medication or cataract surgery, compared to households with higher asset ownership (Mathenge et al., 2007; Njau et al., 2006). The specific dimensions contributing to poverty are

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multidimensional and vary considerably across countries and contexts (Mitra et al., 2013).

Economic indicators, such as income or asset ownership, are not the only aspects contributing to poverty, but scarcities in education, health care, and employment play a significant role in the larger African region (Mitra et al., 2013; Trani & Loeb, 2012).

In some African countries, such as Mauritius, low educational attainment is estimated to be the single largest contributing factor to poverty for households with disabilities (Mitra et al., 2013). Filmer (2008), in his study of data from 14 national household surveys, found a 2%–5% reduction in the probability of being poor with each additional year of education for households with an individual with disabilities. For most of the African countries in the study, the estimated reduction was equivalent to 0.6%–2.1%.

Like socio-cultural barriers, factors of poverty and resource scarcity are present at all levels of the ecological systems theory. As Banks and Polack (2014) state, “exclusion of children with disabilities from education for example, can generate costs to individuals, families and societies through limiting work opportunities and subsequent lifetime earning potential” (p. 1). Study results indicate that persons with disabilities are not only less likely to participate in school but are also less likely to be employed (Mitra et al., 2013). At the same time, to the degree that improvements in education also result in increased productivity, decreased unemployment, and greater economic activity, researchers for the International Labor Organization estimate gains of up to 3%–5% of the gross domestic product for select countries in the region (Buckup, 2009). Few researchers estimate the actual return of investment of educating persons with disabilities in low- and middle-income countries, however, and no such study was found specifically in the East African region. Although differing in their methodologies and specific rate of return estimates, researchers in both Nepal and China estimated rates of return of conservatively 5% to over 19% per year of schooling (Lamichhane & Sawada, 2013; Liao & Zhao, 2013).

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In summary, although the relationship between poverty and disability is complex and at times described as a “vicious circle” (Trani & Loeb, 2012, p. 19), researchers to date point to the centrality of the role of education to mitigate the effects of both poverty and disability. Depending on the country, educational attainment may be the single most contributing factor to poverty for households with a disability. The estimated economic losses resulting from the low school enrollment of children with disabilities in East Africa also highlight the possibility of high returns on investment in these children’s education to benefit the individuals, their families, and societies at large.

Literature Synthesis Summary and Focal Factors

This synthesis of literature points to an existing school enrollment gap for children with disabilities in Ethiopia and the wider East African region. Drivers of this problem of low school enrollment are barriers present at various levels of development of the individual child: the family, school, education system, and larger society. Leveraging the lens of ecological system theory to organize the main barriers to enrollment of children with disabilities in mainstream schools in the East African region also highlights select factors that transcend and affect the child at all these levels. The most notable cross-cutting factors contributing to the low school enrollment of children with disabilities are poverty and traditional socio-cultural barriers and the stigma attached to disability.

Research points to additional drivers that contribute to the low school enrollment of children with disabilities at each of the ecological systems theory levels. At the family level, these drivers include gaps in parental knowledge about disabilities and the value of education. At the school level, a robust body of knowledge points to gaps in effective teacher professional development and teacher support, as well as a lack of specialized materials and resources to facilitate the implementation of inclusive education. Although the evidence is mixed on the

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degree to which the lack of training and resources measurably predicts teacher attitudes and self-efficacy, the repeated mention of this specific challenges across studies, countries, and time present a convincing picture.

At the education system level, studies from East Africa highlight shortcomings in the operationalization of existing national policies in guiding implementation at regional and local levels with sufficient clarity and funding allocations. Researchers of studies discussed in this literature synthesis also identify gaps in the availability of reliable data on prevalence rates of disability, enrollment, and student academic and socio-emotional progress. These data and research gaps have negative effects on policy making as well as inclusive education strategy implementation and monitoring. Studies on the role and work of itinerant teachers in Kenya and Uganda illustrate how a lack of clarity in the operationalization of inclusive education strategies can, in turn, lead to a lack of appropriate support for teachers in mainstream schools.

At the societal level, the literature points to attitudes toward educating children with a disability and poverty as negative effects on the school enrollment of children with disabilities in East Africa. Studies and reports from international organizations at this level highlight the critical role of education for children with disabilities not only from a human rights perspective but also from an economic perspective. The estimated high rates of return on educating a child with a disability hold promise for measurable improvements in income to the benefit of individual families and countries at large.

This dissertation research took place under the Reading for Ethiopia's Achievement Developed Technical Assistance (READ TA) project (see next section for more detail). The project's mandate of intervention on inclusive education is limited to the school level, which is the mesosystem level of the ecological systems theory. As outlined earlier, the international evidence base suggests that attitudinal barriers, gaps in teacher training and support, and a lack

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of specialized materials are significant challenges to the implementation of inclusive education.

Chapter 2 of this dissertation reports the findings from a data collection in 63 schools in five regions of Ethiopia conducted under the auspices of READ TA from December 2016 to January 2017, to validate the existence of these challenges in the Ethiopian context.

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Chapter 2: Empirical Examination of the Problem of Low School Enrollment of Children with Disabilities in Ethiopia

The READ TA project was a 5.25-year (2012–2018) initiative funded by USAID and implemented by RTI and partners. The project’s aim was to improve reading and writing for 15 million children in seven mother tongue languages and English in Ethiopia while building the capacity of local actors. Together with government counterparts and local experts, the project team revised the national primary school curriculum for mother tongue reading and writing instruction, developed new teacher guides and student textbooks, and trained teachers in the implementation of the new curriculum. They also revised the relevant pre-service teacher education courses.

Within this larger project context, a team of RTI staff (the study team), under the leadership of the dissertation author, designed an assistive technology initiative, which is the focal initiative for the present dissertation research. The aim of the assistive technology initiative was to contribute to READ TA's objective to improve reading and writing for all children in mainstream Ethiopian classrooms while addressing select contributors to the problem of low school enrollment of children with disabilities at the classroom level. Barriers specifically addressed include the gaps in teacher professional development and school-level socio-cultural barriers to inclusive education of children with disabilities. These challenges operate at the mesosystem level within the ecological system and contribute to poor educational outcomes for these children as illustrated in Figure 6.

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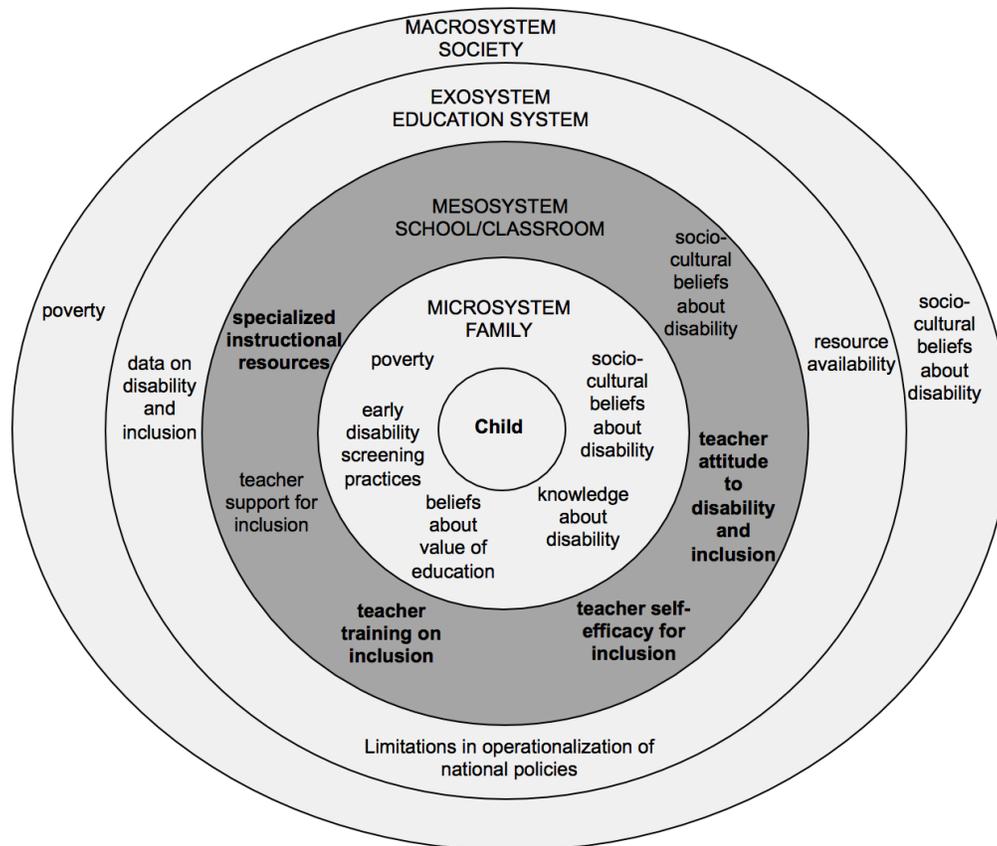


Figure 6. Factors contributing to the low school enrollment of children with disabilities examined in the 2016–2017 data collection. Bold text at the mesosystem level indicates notable barriers to inclusive education.

From December 2016 to January 2017, RTI collected data from 63 schools in five regions of Ethiopia to examine specific barriers to inclusion found at the classroom level in the Ethiopian context. Notably, these barriers are teacher attitudes toward disabilities and their self-efficacy for inclusive education (in bold text in Figure 6). Furthermore, the aim of data collection was to validate the existence of gaps in teacher training and the availability of specialized instructional materials also in the Ethiopian context. Most critically, given the lack of data on disability and inclusion discussed in Chapter 1, and confirmed by recent reports of the Ethiopia MOE (MOE, 2016b), the aim of data collection was to establish the prevalence rate of children with select disabilities in regular Ethiopian classrooms.

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The December 2016–January 2017 data collection also served as the baseline for the three-month assistive technology initiative to improve inclusive education in regular Grade 2 reading classrooms in Ethiopia. The target population for the intervention and accompanying study were regular classroom teachers in Ethiopia who were teaching diverse student populations including students with disabilities. In consideration of recent empirical evidence indicating hearing and vision impairment among the most prevalent disabilities in Ethiopia (Geda et al., 2016), the study team focused on children who are hard of hearing or who have low vision. The study team did not focus the intervention on other disabilities or children who are fully blind or deaf. The following sections describe data collection methods and report on select findings from this baseline assessment.

Baseline Data Collection Purpose and Research Questions

Chapter 1 identified multiple factors within an ecological system that contribute to low school enrollment and poor educational outcomes for children with disabilities in low- and middle-income countries, including Ethiopia (Figure 1). The baseline data collection provided information about the context in Ethiopia related to a subset of these factors and empirically established the existence of specific problems for children with disabilities in Ethiopia. The selected subset of factors included the following needs, service gaps, and systems issues, which represent the research questions for the baseline data collection:

- What is the prevalence of vision and hearing impairment in participating classrooms?
- What are participating teachers' barriers to inclusive education?
- What are participating teachers' current attitudes and self-efficacy for inclusive education?
- What is the participating teachers' current level of adopting inclusive practices in the classroom?

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The research design adopted for this baseline data collection was inherently descriptive (Schutt, 2015). With this perspective, the focus of the data collection was on defining and describing the above-referenced factors in the Ethiopian context, rather than explaining or evaluating specific aspects. Chapter 4 of this dissertation extends this initial descriptive account by describing the overall study and intervention design, including baseline and endline data collections, from an evaluation perspective. The baseline data collection drew primarily on quantitative methods to inform the stated research questions, although open questions were included in all instruments. The next section describes the methodology of the baseline data collection, specifically study participant selection, the final makeup of the study sample, and data collection measures.

Baseline Data Collection Methodology

Selection of Study Participants

Study participants consisted of 110 Grade 2 teachers in Ethiopia who teach mother tongue reading and writing in regular public schools and who teach children who are hard of hearing or have low vision in their classrooms. Study participants also included all the participating teachers' classroom students as well as the teachers' school principals. In adherence to overarching READ TA project parameters, data were collected from classroom teachers in five regions (Amhara; Ethio-Somali; Oromiya; Southern Nations, Nationalities, and Peoples Region [SNNPR]; and Tigray) who are teaching reading in one of seven languages (Afaan Oromo, Af-Somali, Amharic, Hadiyyisa, Sidaamu Afoo, Tigrinya, or Wolayttatto).

All participating teachers met several prerequisites including previous received teacher training on the revised mother tongue curriculum for reading and writing and the new textbooks developed under the larger READ TA project. Participating teachers were selected in a multistage sampling procedure within each of the five regions (in SNNPR, the selection started

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at the zonal level as the determinant of the language of instruction). The study team established the selection criteria and made the final selection from the participating regions in consultation with MOE staff. The aim of the data collection was to reach 110 teachers, two teachers per school, in 55 schools in the five regions: 10 schools each in the Amhara, Ethio-Somali, Oromiya and Tigray regions, and 15 schools (five per language) in SNNPR.

Selection of zones. In the Amhara, Ethio-Somali, Oromiya, and Tigray regions, two zones each were selected for participation. In SNNPR, the activity was implemented in three zones (one each for Hadiyyisa, Sidaamu Afoo, and Wolayttatto, respectively). Where possible, selection of zones—in all but SNNPR—was by the zone’s achievement in distributing the new reading textbooks at the child level and comprehensiveness in ensuring participation of its teachers in the teacher training on the new teacher guide. Apart from that, selection of zones was by the convenience—reachable within a half-day’s drive of the regional capital. Selection of the remaining zones was random.

Selection of clusters. In each zone, two clusters were selected. Selection of clusters was, again, by the degree of coverage of the new textbooks in Grade 2 classrooms and the teachers’ past participation in the training. Among the eligible clusters, the selection was random.

Selection of schools. In one cluster, three schools were selected, and in the other cluster, two schools were selected. Selection of schools within each cluster was also by the degree of coverage of the new textbooks in Grade 2 classrooms and teachers’ past participation in the training. Selected schools also had to have at least two Grade 2 classrooms and known attendance of children who are hard of hearing or have low vision in Grade 2. Among the eligible schools, the selection was random.

Selection of classrooms and teachers. In each school, two classrooms and their respective classroom teacher were selected. Selection of classrooms within each school was by

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the degree of coverage of the new textbook in Grade 2 classrooms and the teacher's past participation in the training. Selected classrooms also had to have at least three children with a hearing impairment or vision impairment—either already known or identified following the baseline screenings. Among the eligible classrooms in the school, the selection was random. For ethical reasons, classrooms were ineligible for participation if they included children who were fully blind or deaf because no specific accommodation or modification for these children was included in the assistive technology initiative.

If a selected school did not have two classrooms meeting the established criteria, data were collected in just one classroom. If the selected school did not have at least one classroom meeting the criteria established, another school was selected, applying the same criteria. If the appropriate classrooms were not found in a selected cluster, another cluster was selected, applying the same criteria. If the appropriate classrooms, schools, or clusters were not found in a selected zone, another zone was selected, applying the same criteria.

Final Baseline Study Sample

The final study sample consisted of a total of 109 Grade 2 teachers, of which 82 (75%) were women. Over half of the participants (53%) reported their age to be between 25 and 34. On average, participating teachers had been teaching in Grades 1–4 for about 10 years, with the range being between two and 38 years. Nearly 90% reported having a diploma as their highest educational training level. Regarding specific training on special needs education, nearly 39% of participants reported never having received any specific training on the topic. Forty percent of participating teachers reported having attended one college course, and 10% had attended two college courses on inclusive education. Three teachers reported having a certificate and three a diploma each in special needs education.

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Participating teachers came from a total of 63 public primary schools in five regions of Ethiopia, specifically from 12 schools in Oromiya; 10 schools each in Amhara, Tigray, and Ethio-Somali; and 21 schools in SNNPR (eight schools each in Hadiya and Sidama and five schools in Wolayita). Participating schools, on average, had 1,436 students, with the range being 287 to 3,440 students overall. The average class size of the participating Grade 2 classrooms in the study was 58 students, with a range of 32 to 147 students overall. A total of 3,728 Grade 2 students participated in the vision screening, of which 47% were female. Overall, 3,725 Grade 2 students participated in the hearing screening of which also 47% were female. A subset of 727 students, 48% female, were interviewed. Of these, 30% had been identified with a vision impairment and 25% with a hearing impairment. This total sample was made up of 398 students with a vision or hearing impairment and 328 students without at baseline. The interviewed students were on average 9.5 years old, with the range being between six and 17 years of age. In addition to the teacher interviews and student screenings, data collectors completed 375 classroom observations in the selected classrooms and interviewed 59 principals.

Baseline Measures

The study team applied six instruments during the baseline data collection: (a) a clinically validated vision screening tool, (b) a clinically validated hearing screening tool, (c) a teacher interview questionnaire, (d) a classroom observation tool, (e) a student interview instrument, and (f) a principal interview questionnaire. The purpose of the principal interview for this dissertation was to collect demographic and contextual information on the participating schools. Further details on this instrument are thus not reported on in the remainder of this dissertation.

Except for the screening tools, all instruments were drafted in English and translated into the seven mother tongue languages of the participating classrooms. Preliminary instruments were rendered for electronic administration in RTI's open source data collection platform,

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Tangerine™, and then loaded on 7-inch tablet devices. The study team conducted a field test of the instruments in two local languages, Amharic and Afaan Oromo, in December 2016. Six schools, three in Amhara and three in Oromiya, were visited; a total of 318 students were screened; 12 classrooms were observed; and 64 students, 12 teachers, and six principals were interviewed. Data collectors noted procedural issues with the tools and their application using a systematic instrument review guide. RTI statisticians evaluated the instrument test data for potential issues with the electronic rendering, variable definitions, and data values, as well as with specific questions and their analysis. As a result of the instrument field test, several questions and answer categories were deleted or changed to arrive at the final instruments.

Measuring the prevalence of vision and hearing impairments. To measure the prevalence of visual impairment and hearing impairment in participating classrooms, the study team used existing, clinically validated tools customized for operation on smartphone devices. To measure visual impairment, a visual acuity test was conducted with participating students using the PeekVision screening app for distance vision (T. Carter, personal communication, November 20, 2016). Based on the test results, each student's vision was classified into one of five severity levels: (1) normal, (2) mild impairment, (3) moderate impairment, (4) severe impairment, and (5) blindness. The five levels correspond to numerical LogMAR scores of visual acuity, as outlined in Table 1. These categories are in line with those used by the WHO (WHO, 2010). Only students identified with mild, moderate, or severe visual impairments were considered a target population for the initiative. The result of the weaker eye was used to establish a student's visual category.

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Table 1

PeekVision Visual Categories and LogMAR and Snellen Score Ranges for Each

Visual Category	LogMAR Score Snellen
Normal	0–0.3 6/6–6/12
Mild visual impairment	>0. –0.48 >6/12–6/18
Moderate visual impairment	>0.48–1.0 >6/18–6/60
Severe visual impairment	>1.0 >6/60–3/60
Blindness	>1.3 >3/60

To measure hearing impairment, a hearing test was administered with participating students using the HearScreen screening app (D. W. Swanepoel, personal communication, October 27, 2016). Based on the test results, each student’s hearing was classified into one of six severity levels: (1) normal, (2) slight impairment, (3) mild impairment, (4) moderate impairment, (5) moderate-severe impairment, and (6) severe impairment. The six levels correspond to numerical scores of hearing loss measured in decibels (dB), as shown in Table 2, for three frequencies measured in hertz (Hz), 1,000Hz, 2,000Hz, and 4,000Hz. The HearScreen categorizations are similar to those used by the WHO (WHO, 2017). The WHO considers a slight and mild loss to be between 26dB and 40dB, moderate loss between 41dB and 60dB, severe loss between 61dB and 80dB, and anything over 81dB as a profound loss. Only students identified with mild, moderate, moderate-severe, or severe (but not deaf) hearing impairment, as categorized by the HearScreen app, were considered a target population for the initiative. The result of the weaker ear on one or more frequencies determined the student’s hearing category.

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Table 2

HearScreen Hearing Categories and Related Loss in Decibels

Hearing Category	Decibel Loss (one or more frequencies)
Slight loss	<35 dB
Mild loss	35 to 44 dB
Moderate loss	45 to 54 dB
Moderate-severe loss	55 to 64 dB
Severe loss	>65 dB

Note. dB = decibel.

Establishing teachers' barriers to inclusive education. The study team included a set of questions as part of a larger teacher interview instrument to establish participating teachers' barriers to inclusive education. Questions were Likert scale statements with the following answer options and their respective data values: *strongly disagree* (1), *disagree* (2), *neutral* (3), *agree* (4), and *strongly agree* (5). Teacher respondents were asked to select their level of agreement with a set of problems or challenges in implementing inclusive education. Example items included lack of training, shortage of teaching and learning materials for visual or hearing impairment, large class sizes, and lack of parental support.

Four members of the study team, under the leadership of the dissertation author, developed the items in consideration of the existing empirical evidence from Ethiopia and the East African region (see Chapter 1). The instrument development team included evaluation experts, inclusive education experts, and education experts with Ethiopia expertise. In addition, two Ethiopia-based researchers reviewed the scales, which further strengthened content and face validity of the measures. To ensure the comprehensiveness of the presented list of potential problems, the study team included an open item querying for any additional barriers teachers may be facing in the instrument field test, which informed the final set of statements.

Measuring teacher attitude and self-efficacy. To measure participating teachers' attitude toward inclusive education and their self-efficacy for teaching children with vision or hearing impairments, the study team used 5-point Likert scales on inclusive education as part of the larger teacher interview instrument. Existing scales on teacher attitude and self-efficacy in inclusive education provided the source for select items, but no single existing scale was deemed appropriate for the specific purpose of this research. This limitation of available instruments stems from the fact that existing scales took all disability types into account, rather than just hearing and vision impairment. Thus, the same instrument development team mentioned earlier established new scales. Two Ethiopia-based researchers again reviewed the scales to strengthen content and face validity of the measures.

For the present study, *attitude* was defined as “learned pre-disposition to respond in a consistently favorable or unfavorable manner with respect to a given object” (Fishbein & Ajzen, 1975, p. 6). The study team specifically focused on teachers' attitudes toward the inclusion of students with mild or moderate vision or hearing disabilities (not fully blind or deaf) into regular classrooms for 80% or more of the school day. To measure teacher attitudes toward inclusive education, the instrument development team examined existing inclusive education attitude scales in the peer-reviewed literature (Agbenyega, 2007; Cullen, Gregory, & Noto, 2010; Forlin, Earle, Loreman, & Sharma, 2011; Hofman & Kilimo, 2014; Saloviita, 2015) and selected 22 attitudinal items, with responses on a 5-point Likert scale for adaptation and inclusion in the initial teacher interview instrument. This process helped enhance construct validity of the new scale. Answer options and their respective data values consisted of *strongly disagree* (1), *disagree* (2), *neutral* (3), *agree* (4), and *strongly agree* (5). Example items of the final attitude scale include (a) I believe that the needs of students with visual or hearing impairments can best

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be served through special, separate classes; and (b) I think that inclusion promotes more academic growth of students with visual or hearing impairments.

Following the data collection with 109 teachers, the study team used factor analysis to examine construct validity and to reduce the scale to what emerged as the most relevant items that together explained over 76% of the variance. The final scale contained 10 items. Only those 10 items were used in the remaining data analysis related to the teacher attitude measure. The scores of the final scale yielded an internal reliability coefficient (Cronbach's alpha) of 0.71 at baseline. The study team quantified the indicator for teacher attitudes toward the inclusive education of children with vision or hearing impairment as the calculated mean score of participating teachers' responses to the 10 items in the final scale (minimum: 10; maximum: 50).

Concerning teacher self-efficacy for inclusive education, the same instrument development team examined existing self-efficacy scales on inclusive education in the peer-reviewed literature (Hofman & Kilimo, 2014; Malinen et al., 2013; Sharma, Loreman, & Forlin, 2012). For the study, *self-efficacy* was defined as "beliefs in one's capabilities to organize and execute the course of action required to produce given attainments" (Bandura, 1997, p. 3). The study team specifically focused on teachers' self-efficacy toward teaching students with sensory disabilities, that is, those who have low vision or are hard of hearing (not fully blind or deaf), in regular classrooms for 80% or more of the school day. The instrument development team adapted nine self-efficacy items from existing scales. For all items, responses entailed a 5-point Likert scale with the same response options as those for the attitudinal scale. Example items of the final self-efficacy scale include (a) I feel comfortable designing learning tasks appropriate for children with vision or hearing impairment and (b) if a student with a vision or hearing impairment does not understand something I explained, I will find another way to increase her/his understanding.

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The study team again applied factor analysis to reduce the self-efficacy scale to what emerged as the most relevant items that together explained over 97% of the variance. Only those six items were used in the remaining data analysis related to the teacher self-efficacy measure. Internal reliability was determined using Cronbach's alpha. Baseline scores of the final scale yielded a modest reliability coefficient of 0.67. As done similarly for the attitude scale, the study team quantified teacher self-efficacy for the inclusive education of children with vision or hearing impairment as the calculated mean score of participating teachers' responses to the six items in the final scale (minimum: 6; maximum: 30).

In addition to the attitude and self-efficacy scales, the teacher interview questionnaire contained demographic questions on teachers' gender, age, teaching experience, training on inclusive education/special needs instruction, and knowledge of the prevalence of disability among their students. The original teacher questionnaire appears in Appendix A.

Measuring teachers' inclusive practices in the classroom. To measure teachers' actual utilization of inclusive practices for students who are hard of hearing or have low vision in their classrooms, the study team utilized two data collection methods and corresponding instruments. First, the study included lesson observations using a structured lesson observation instrument. Second, the study team interviewed students about their teacher's instructional practices.

No existing classroom observation instrument (e.g., Rose & Meyer, 2002; Soukakou, Winton, West, Sideris, & Rucker, 2014) seemed appropriate for the purpose and context of this research. Thus, the instrument development team designed a new instrument, drawing on years of expertise in the development of classroom observation instruments for mother tongue reading and writing instruction, as well as the expertise in special needs instruction and Ethiopia.

The new classroom observation instrument contained three parts. In the first part, the instrument captured classroom demographics; in the second part, it captured observations on

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individual students in the classroom—their placement in the classroom and their interaction with peers, and their instructional engagement. In the final part, the instrument captured observations of the teacher's behaviors and practices, including speaking clearly, repeating questions and responses, or describing pictures or illustrations used for the lesson. Answer options captured teachers' frequency of using these practices during the lesson as *never* (0), *rarely* (1), *sometimes* (2), *frequently* (3), or *all the time* (4). The final classroom observation instrument appears in Appendix B.

To triangulate data sources on teachers' inclusive practices (Krefting, 1991), the study team combined teachers' self-reported data and the classroom observation data with data collected directly from students. As found with the classroom observation instrument, no existing student interview instrument on inclusive education (e.g., Diamond, 2001) was found to fit the purpose and context of this study. Thus, a new student interview questionnaire was developed, following the same process done for the classroom observation instrument outlined earlier. The student instrument contained four parts. In the first part, the instrument captured basic demographic data on the student and in the second part, the instrument contained a reading assessment (which is not further analyzed and reported on for this dissertation). In the third part, the instrument contained a set of questions about the student's home and reading environment and in the last part, questions about the student's experience with disabilities. Items in this last section specifically queried students about whether their teacher makes sure that they hear and see what the teacher and other students are saying, whether students feel that they can ask their teacher to repeat a question or response from others, and whether their teacher calls on them during class. Students screened for a potential vision or hearing impairment were also asked whether they had any special materials such as reading books with big letters or devices to help them see or hear better. The final student questionnaire appears in Appendix C.

Institutional Review Board Review

RTI's Institutional Review Board exempted the activity from review, given that it took place in an established education setting and involved practices that are considered reflective of this environment for the participating children. Participation in the data collection and initiative was voluntary for principals, teachers, and students. No student names were collected or stored that would allow identification of individual's screening data or interview data on the smartphones or tablets. The study team sought oral consent from all participants in advance of the data collection to ensure participants understood who was conducting the research, its purpose, what was expected of them, the potential risks and benefits of their participation, and whom to contact should there be concerns or questions. The English versions of the consent statements, combined with their respective instruments, are attached in Appendices A, B, and C.

Baseline Data Collection Methods and Analysis

For the data collection, the study team engaged 33 assessors consisting of READ TA project staff, regional education experts, special needs experts, and contracted data collection specialists. Assessors were fluent in at least one of the seven mother tongues in which the instruments had been translated. The study team conducted a three-day assessor training in November 2016 to familiarize data collectors with the initiative, the purpose of the data collection, and the instruments. Participants practiced the application of each instrument, including with a principal, teachers, and students in two schools in Addis Ababa.

For the actual data collection, assessors formed 11 teams, two teams per language for Afaan Oromo, Af-Somali, Amharic, and Tigrinya and one team per language for Hadiyyisa, Sidaamu Afoo, and Wolayttatto. Data collection took place in each participating region and zone from December 19, 2016, to January 5, 2017. The regional education bureau in each region informed participating schools of the arrival of the data collection teams in advance of their visit.

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Upon arrival of the data collection teams, the data collection team leader, an RTI staff member, introduced the initiative to the principal and obtained oral consent from the principal to conduct the initiative and all parts of the data collection in their school.

Data collection teams then screened all Grade 2 children in the selected classrooms for a potential hearing or vision impairment. Next, data collectors conducted the student interviews with all participating students identified to be hard of hearing or have low vision as well as an equal number of children not identified with these impairments for contrast. Following the student interviews, usually on the next day, data collectors observed the selected Grade 2 classrooms. To ensure the data collectors' ability to concentrate on the teacher–student interactions, no data collector observed more than four students in the same classroom for the same lesson. Thus, up to three data collectors, depending on the number of students identified, observed the same classroom at the same time. The data collectors used the same instrument but identified each individual child for whom they were responsible using the child's unique identification number, which matched the one from the screening and student interview. Lastly, data collectors conducted the teacher and principal interviews.

Data collection teams spent between two to three days at each school, depending on the number of children in selected classrooms. Where classrooms or schools proved to be ineligible for participation, most often because the teachers had not yet received the 10-day teacher training, or the classroom did not have at least three children with a vision or hearing impairment, replacements were sought as outlined earlier. The study team, under the leadership of the dissertation author, developed a detailed baseline assessment protocol outlining these procedures to strengthen the quality and consistency of the data collection across assessor teams. The baseline assessment protocol appears in Appendix D.

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All data were collected electronically using HearScreen and PeekVision and remaining data using Tangerine. When connectivity to the Internet was sufficient, data collectors uploaded their data in encrypted form to a central server throughout the data collection process. Other data collection teams uploaded their data upon their completion of the data collection. The HearScreen and PeekVision data system and Tangerine platforms then allowed for the export of all data, by instrument, as comma-separated values files.

An RTI statistician, together with the dissertation author analyzed the data in RTI's home office in North Carolina. All data were cleaned (e.g., correcting school names or student ID numbers to uppercase where appropriate) and datasets merged for analysis. The statistician and dissertation author used Stata data analysis and statistical software for all data analysis. Most of the analysis entailed the calculation of frequencies and were thus descriptive. For the teacher attitude and self-efficacy measures, the statistician and dissertation author also conducted inferential statistical analysis, specifically regressions, to determine predictors of positive teacher attitude and self-efficacy in inclusive education.

Baseline Study Findings

This section presents the findings from the baseline data collection. Results are presented in line with the research questions outlined earlier in this chapter, addressing (1) the prevalence of vision and hearing impairments in participating classrooms and (2) participating teachers' barriers to inclusive education. The section also presents findings on (3) participating teachers' current levels of attitudes and self-efficacy for inclusive education and (4) their current level of adopting inclusive practices in the classroom.

Prevalence of Vision and Hearing Impairment

Among the 3,728 children screened for a potential vision impairment, 5.37% of children were identified to have some form of vision impairment, of which 53% were female. Table 3

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outlines the number and percentage of children identified by visual category out of the 3,728 children screened.

Table 3

Number and Percentage of Students Identified by Visual Category

Visual Category	Number of Students	Percentage
Normal	3,518	94.37%
Mild visual impairment	70	1.88%
Moderate visual impairment	104	2.79%
Severe visual impairment	26	0.7%
Blindness	0	0%
No response	10	0.27%

Among the 3,725 children screened for a potential hearing impairment, 4.86% of children were identified to have some form of hearing impairment, of which 51% were female. Table 4 outlines the number and percentage of children identified by hearing category out of the 3,725 children screened.

Table 4

Number and Percentage of Students Identified by Hearing Category

Hearing Category	Number of Students	Percentage
Normal	3,544	95.14%
Mild loss	79	2.12%
Moderate loss	27	0.72%
Moderate-severe loss	26	0.7%
Severe loss	49	1.32%

Among the sample, 14 participating students were identified with both a vision and a hearing impairment out of a total of 367 unique children (or 9.84% of the total sample of 3,728 students) identified with a vision and/or hearing impairment. When asked before the student screenings took place, participating teachers only reported knowing of just over 2% of students

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with any disability in their classrooms. This finding indicates a significant gap between the known and actual prevalence rates of disability in participating classrooms. The screened 9.84% of students with a vision and/or hearing impairment is also a significantly larger proportion compared to the known (by the caregiver) 2.6% prevalence rate of any type of disability that was found by Geda et al. (2016). In addition, the number for low vision mentioned earlier (5.37%) is also higher than the 3.7% prevalence rate for low vision that was found in the nationally representative study of 30,022 households conducted in Ethiopia in 2008, which was based on a test of visual acuity administered by ophthalmologists and ophthalmologic nurses (Berhane et al., 2008).

As outlined in the problem of practice statement, the current known enrollment rate of children with disabilities in Ethiopia (as reported by school principals to the regional state education bureau for inclusion in the national education statistics published by the MOE) is estimated to be 0.38% of the total primary school student population. Although the prevalence data found in this needs assessment do not directly speak to the low school enrollment of children with disabilities, they confirm not only significant proportions of children with disabilities who are not in school but also significant proportions of children with undiagnosed disabilities already in school.

Teachers' Barriers to the Implementation of Inclusive Education

Data from the study indicated that participating teachers faced a wide range of challenges in implementing inclusive education in their classrooms. Among the most dominant challenges were the shortage of instructional materials for vision and hearing impairment, lack of sufficient teacher training, insufficient government support, and lack of parental support. Based on responses from all 109 participating teachers, Table 5 shows the percentage of teachers who

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reported that they agreed or strongly agreed that each challenge presented a barrier to implementing inclusive education in their classrooms.

Table 5

Barriers to Inclusive Education and Percentage of Teachers Who Agreed or Strongly Agreed

Challenge as a Barrier to Inclusive Education	Percentage of Teachers Who Agreed/Strongly Agreed
Shortage of teaching and learning materials for visual or hearing impairment	97.24%
Lack of training	93.58%
Insufficient government support	88.07%
Lack of parental support	86.24%
Large number of students in classrooms	77.98%
High teaching load for teachers	76.15%
Poor working environment	66.06%
Lack of support from school leadership in implementing the MOE inclusive education strategy document	54.13%
Teacher attitudinal problems	52.3%
Severity of disability	50.45%
Lack of clarity on the MOE inclusive education strategy document	47.71%
Lack of guidance in implementing the MOE strategy document	47.71%

Note. MOE = Ministry of Education

Teachers' responses regarding challenges such as attitudes and severity of disabilities, as well as those related to the inclusive education strategy document, showed high levels of variance among respondents. Although over 52% of teachers agreed or strongly agreed that teacher attitudes were a problem in implementing inclusive education, 42.2% disagreed or even strongly disagreed with this statement. Similarly, although over 50% of teachers believed that severity of disability presented a challenge in implementing inclusive education, 38.5% disagreed or strongly disagreed with this assertion. Furthermore, at least 16% of the participating teachers indicated they were not aware of the MOE inclusive education strategy document.

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Teachers also mentioned the identification of students with special needs as a barrier to better serving these students in their classroom and school. Several teachers indicated reliance on the parents or students themselves to inform them of a disability. Other teachers noted the lack of specialized identification tools or approaches that limited them to identify children with disabilities mostly through observation of student behavior and performance. In addition to these issues with identification, participating teachers raised problems with the physical infrastructure in their schools. These problems included a lack of desks, benches, toilet facilities, clean water, and safe access or transportation to school.

These findings establish gaps in teacher professional development and a lack of specialized materials and resources as among the most notable challenges in the implementation of inclusive education in participating schools in Ethiopia, confirming results from other research in the region (Hofman & Kilimo, 2014; Ojok & Wormnaes, 2013).

Teachers' Attitudes and Self-Efficacy for Inclusive Education

Analysis of the data indicated participating teachers' attitudes toward inclusive education were slightly positive. The mean score of teachers' responses was 34.5 (minimum: 10; maximum: 50; n = 109), equivalent to the 61st percentile of the score. Participating teachers' self-efficacy for inclusive education was also slightly positive. The mean score of teachers' responses was 22.1 (minimum: 6; maximum: 30; n = 109), equivalent to the 67th percentile of the score.

The study included additional analysis to establish what factors may be predictors of positive teacher attitude or self-efficacy in inclusive education. A child with a known hearing impairment in the classroom was found to be a predictor of a more positive attitude toward inclusive education among participating teachers. Other variables, including teacher gender, teacher age, training background, self-efficacy, or class size were not found to be statistically

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significant. No single variable, including teacher gender, teacher age, training background, teacher attitude, or class size appeared to be predictors of participating teachers' self-efficacy for inclusive education.

Analysis of teachers' responses to individual attitude or self-efficacy statements in more detail shed light on the complexity of the issue. Although most (71%) of the teachers agreed or even strongly agreed that inclusion promotes more academic growth of students with moderate visual or hearing impairment, the majority (64%) at the same time felt that the needs of students with moderate visual or hearing impairment can best be served through special, separate classes. Similarly, although most participating teachers (76%) agreed or even strongly agreed that they felt comfortable designing learning tasks appropriate for children with visual or hearing impairments and most (74%) stated that they can use a variety of assessment strategies to evaluate these students, most teachers (86%) also felt students with visual or hearing impairments are better served by a special needs teacher.

These findings indicate that, although teachers overall may hold a slightly positive attitude toward teaching children with a hearing or vision impairment in their classrooms, and a slightly positive sense of self-efficacy for doing so, the opinion that the needs of these students may be better served outside of the regular classroom and by special needs teachers prevails. The results suggest that socio-cultural factors, including teacher attitudes and opinions, are barriers to inclusive education in participating classrooms in Ethiopia. These findings complement previous research in the country and the wider East African region (Arbeiter & Hartley, 2002; Dagneu, 2013; Hofman & Kilimo, 2014).

Teachers' Inclusive Practices in the Classroom

Results from the classroom observations indicated that in most observations (67%) teachers frequently, or always, spoke clearly and loudly enough to be heard in the back of the

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classroom. In 18% of observations, this effort was rarely or never noted. In nearly 67% of classroom observations, teachers were facing the class while talking without obstructing their mouths. However, in 18% of observations, teachers rarely or never spoke while facing the class or without obstructing their mouths. In over a third of the observations, teachers rarely or never repeated a question or response or orally described a picture or illustration used for the lesson. In 35% of the observations, teachers at least frequently ensured that students were paying attention before beginning an activity. In 33% of the observations, however, this effort was rarely or never noted.

In over two thirds of the classroom observations, teachers rarely or never wrote the lesson objective on the board. In just over half of the observations, teachers wrote questions on the board. Few observations (16%) noted teachers using self-made teaching aids to support instruction, and fewer (5%) noted teachers using materials specifically in support of children with disabilities. In 83% of the classroom observations, the students were using the new student textbooks for mother tongue reading and writing. However, in more than half of the classroom observations, teachers did not use the new teacher guide during the observed lesson.

Regarding student seating arrangements, 41% of the observed children (which were those identified with a vision or hearing impairment during the screening procedure) sat at the front of the room, and over 71% sat where lighting is best. In just under 50% of observations, questions were rephrased or repeated for the observed students. In 35% of the observations, extra time was given to students to respond to questions. In 25% of the observations, students were permitted to respond verbally and/or in writing or sign language.

Among the students who had been identified as having mild to severe hearing or vision impairments, the observers found that more than half of these children (56%) appeared to be on-task (i.e., focused on the teacher, class, or work assigned). Another 41% of students were off task

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during the lesson, and 5% of students were identified as disruptive (i.e., speaking out of turn, making noise, fighting or talking with other students). In most cases (55% of observations), assessors noted positive interactions between students with impairments and their peers (i.e., talking appropriately with classmates, engaging in group discussion, or taking turns). However, 11% of observed children were reported to interact negatively with their classmates (i.e., speaking inappropriately or disrupting group work). Over a third of observed children were sitting alone and exhibited no interaction with their peers.

These results from the classroom observations may need to be considered with caution. The significant discrepancy between the number of children with a disability known to the teacher and the number identified from the screenings, indicates that teacher practices or classroom arrangements that were indexed in this needs assessment as *inclusive*, such as speaking loudly or seating children with a hearing or vision impairment in the front of the classroom, may be part of teachers' usual practices or simple coincidence rather than indicative of a systematic accommodation. Similarly, some of the behaviors of the students identified with a vision or hearing impairment, including being off task or passive, were observed not as unique to this group only but as behaviors also exhibited by other children in the classroom.

Despite those limitations, findings from the classroom observations indicate that significant proportions of teachers rarely implement even foundational instructional accommodations to the benefit of children with vision or hearing impairment as well as all other children in their classroom. Such practices included writing lesson objectives and key questions on the board, repeating questions and responses, and ensuring that students are paying attention before beginning an activity.

Findings from student interviews about students' experience with disabilities and their teacher's instructional practices indicate a mixed picture. As outlined earlier, the study team

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found the prevalence of vision and hearing impairments among participating students to be significantly higher than that known by their teachers. However, when asked directly whether they had trouble seeing what the teacher wrote on the blackboard or hearing what the teacher was saying, responses from participating students identified for a vision or hearing impairment were inconclusive. Among those students who had been identified with a moderate or severe vision impairment, only 47% (42 students) confirmed that they had difficulty seeing what the teacher wrote on the blackboard. This result potentially indicates that teachers are writing in a large enough font to mitigate the vision loss or that the children had not yet realized that their vision differs from that of their peers. Two thirds (39) of the students identified with a moderate or even severe hearing impairment confirmed having trouble hearing what the teacher was saying in class. Again, it is possible, and results from the classroom observations support this, that teachers are naturally speaking clearly and loudly enough to compensate—at least to some extent—for the hearing loss. Alternatively, children may not yet have realized that their hearing differs from that of their peers. Regarding students' experience with disabilities, over 80% of participating students indicated not knowing anybody in their class with a disability, and over 90% of participating students indicated not having a friend with a disability.

In summary, these findings from the baseline data collection establish challenges with teacher attitudes, insufficient teacher professional development, a lack of specialized materials, and limitations in teachers' inclusive instructional behaviors among the most notable barriers to the implementation of inclusive education in participating schools in Ethiopia. These findings confirm results from other research on inclusive education in the East African region (Arbeiter & Hartley, 2002; Hofman & Kilimo, 2014; Ojok & Wormnaes, 2013). These challenges also align with key elements of the theory of planned behavior (Ajzen, 1991). Chapter 3 of this dissertation describes this theory and outlines how its application in inclusive education may serve further

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exploration of the barriers found in Ethiopia. The chapter then draws on the theory of planned behavior to establish the contextual, theoretical, and empirical foundation for an intervention aimed at addressing these classroom-level barriers to quality inclusive education in Ethiopia.

Chapter 3: Empirical Foundations for Improving Inclusive Education in Ethiopia

Intervention Context and Focal Factors

The findings of the data collection, from December 2016 to January 2017, presented in Chapter 2 highlight barriers to inclusive education involving teacher attitudes, teacher self-efficacy, and adoption of inclusive instructional behaviors in participating schools in Ethiopia. As highlighted earlier in Figure 6, these barriers are at the mesosystem level of ecological systems theory and affect developing children at a level of proximity just beyond their immediate family environment. These barriers also parallel key dimensions of the theory of planned behavior (Ajzen, 1991). The next section describes the theory of planned behavior and outlines how its application in inclusive education may serve further exploration of the barriers found in Ethiopia.

The Theory of Planned Behavior as a Framework for Research and Intervention

Icek Ajzen developed the theory of planned behavior as part of an effort to research and predict the relationships among individuals' *attitudes*, their behavioral *intentions*, and their actual *behaviors* (Ajzen, 1985). According to Ajzen, behaviors tend to originate from an intention to execute the specific behavior. This intention, in turn, is influenced by an individual's attitude toward the planned behavior as well as the *subjective norms* and expectations of their community. Furthermore, results from research on behavior indicate that an individual's sense of control over the factors that affect his or her ability to exercise the behavior plays a role in whether behaviors are adopted (Ajzen, 1985). Sense of control is conceptualized as *perceived behavioral control* in the theory of planned behavior and is derived from two main components: (a) *controllability* of the contextual factors surrounding the behavior and (b) the individual's sense of *self-efficacy*, that is, confidence in their ability to execute on the behavior (Ajzen, 1991). Ajzen (1991) also describes the relationship between the factors in this framework, highlighting

that the stronger an individual's behavioral intention, the more likely its actual enactment.

Figure 7 illustrates the theory of planned behavior adapted from Ajzen (1991, p. 182).

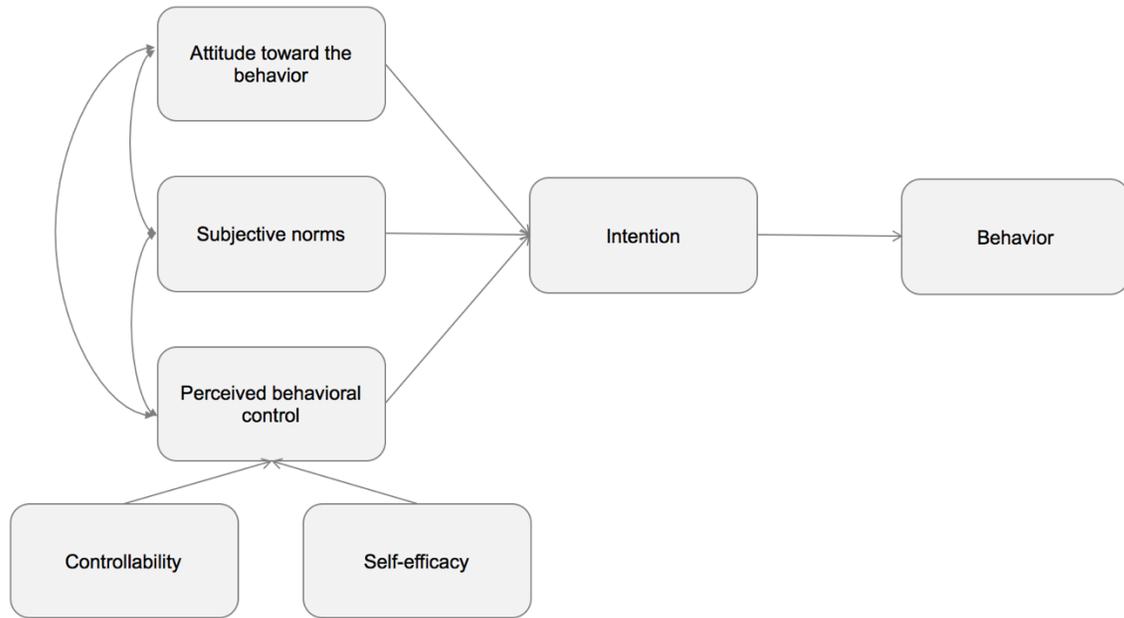


Figure 7. Theory of planned behavior. Adapted from Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211.

doi:10.1016/0749-5978(91)90020-T

Application of the Theory of Planned Behavior to Inclusive Education

The theory of planned behavior has a history of application in research on inclusive education to explain and predict intentions and behaviors in diverse national contexts. Illustratively, MacFarlane and Marks Woolfson (2013) applied the theory to study teachers' attitudes and behavior toward the inclusion of children with social, emotional, and behavioral difficulties in 61 mainstream schools in Scotland. The authors found that the subjective norms teachers experienced in their schools predicted their behavior for inclusion. Results also indicated that positive teacher attitudes and higher levels of teacher self-efficacy correlated with higher degrees of intention to engage with the children with social, emotional, and behavioral

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difficulties in their classroom (MacFarlane & Marks Woolfson, 2013). The theory of planned behavior also informed research by Ojok and Wormnaes (2013) aimed at investigating attitudes and willingness for the inclusion of children with intellectual disabilities among teachers of regular classrooms in rural Uganda. The authors found a strong positive correlation between teachers' attitudes toward inclusion of students with intellectual disabilities and their willingness to teach these children (Ojok & Wormnaes, 2013).

Kurniawati, de Boer, Minnaert, and Mangunsong (2017) applied the key tenets of the theory of planned behavior to their discussions on the effect of a teacher in-service training program on inclusive education in Indonesia. The authors explored the outcomes of a 32-hour training program on teachers' attitudes, knowledge, and teaching strategies for students with disabilities and found improvements in teachers' attitudes and self-efficacy in inclusive education. The authors indicated, building on the theory of planned behavior, that teachers' attitudes and knowledge (internal factors aligned with the theory's dimensions of attitude and self-efficacy), as well as time and opportunity (external factors related to the theory's aspects of subjective norms and controllability) to implement inclusive education, should be considered in intervention design (Kurniawati et al., 2017).

In view of the factors affecting the low school enrollment of children with disabilities established in Chapter 1 and the specific subset of factors influencing their classroom experience in Ethiopia explored in the needs assessment described in Chapter 2, the next section synthesizes interventions aimed at improving the quality of inclusive education at the classroom level in mainstream schools in East Africa and beyond. The focus of the synthesis is on interventions conducted at this mesosystem level with a specific focus on the theory of planned behavior's components of teachers' attitudes, subjective norms, and perceived behavioral control and self-efficacy. The synthesis also establishes the current evidence base on interventions that have

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addressed the combined output of attitudes, norms, and perceived behavioral control, that is, teachers' intention to implement inclusive education and how these intentions might manifest in the adoption of inclusive instructional behaviors.

As illustrated in Table 6, and detailed in the following synthesis, interventions to date have applied a range of approaches to improving inclusive education also within the specific dimensions of the theory of planned behavior. Illustratively, researchers to date have employed a diverse set of approaches, such as co-teaching, school-wide initiatives, and stand-alone in-service teacher training, to explore teacher attitudes toward inclusive education. Similarly, researchers have applied school-wide initiatives, stand-alone in-service teacher training, and collaborative initiatives to address subject norms at the school level. In contrast, research on teachers' behavioral intention and inclusive practices has predominantly entailed various forms of stand-alone in-service teacher training to date (e.g., online or hybrid training, training with performance feedback).

Table 6

Overview of Theory of Planned Behavior Dimensions and Intervention Approaches Synthesized for Each

	Co-teaching	School-Wide Initiatives	Stand-Alone In-Service Teacher Training	Structured School Collaborations	Collaborative Consultation
Teacher attitudes	X	X	X		
Subjective norms		X		X	
Teacher behavioral control and self-efficacy			X		X
Teacher behavioral intentions and inclusive practices			X		

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In the absence of a sufficiently large empirical evidence base from Ethiopia or the East African region, selected studies stem from a range of contexts, giving a global perspective on the opportunity. Where available, the synthesis prioritized approaches that show viability in low- or middle-income countries over programs that demonstrate impact only in higher-income contexts. Furthermore, the lines between approaches, (e.g., between school-wide initiatives and collaborative consultations) are not always clear-cut, and studies may thus be synthesized in more than one approach category across the dimensions of the theory of planned behavior. The next sections introduce each intervention approach with its specific characteristics and findings across a relevant sample of studies.

Addressing Teacher Attitudes Toward Inclusive Education

Approaches to improving teacher attitude toward inclusive education in the existing literature include co-teaching (Rivera, McMahon, & Keys, 2014), school-wide efforts (Al-Manabri, Al-Sharhan, Elbeheri, Jasem, & Everatt, 2013), and stand-alone in-service teacher training (Kurniawati, de Boer, Minnaert, & Mangunsong, 2014). Co-teaching entails two teachers teaching a single inclusive classroom. Like school-wide efforts, co-teaching may include in-service teacher professional development activities but goes beyond stand-alone training approaches.

The focus of existing intervention studies on co-teaching is predominantly on teachers' attitudes toward co-teaching itself (Scruggs & Mastropieri, 2017; Scruggs, Mastropieri, & McDuffie, 2007) rather than elements relevant to inclusive education specifically. A notable exception is research conducted by Dusty and Schneider Dinnesen (2012) and Rivera et al. (2014). However, these studies both took place in the United States and therefore are less relevant to the very different context of Ethiopia. Evidently, a recent systematic review of inclusive education in low- and middle-income countries appears to be silent on co-teaching as a

viable intervention approach in such contexts (Wapling, 2016). Thus, the following sections focus on the current evidence base on school-wide initiatives and stand-alone in-service teacher professional development to address teacher attitudes toward inclusive education. Figure 8 situates the discussion on teacher attitudes within the larger theory of planned behavior.

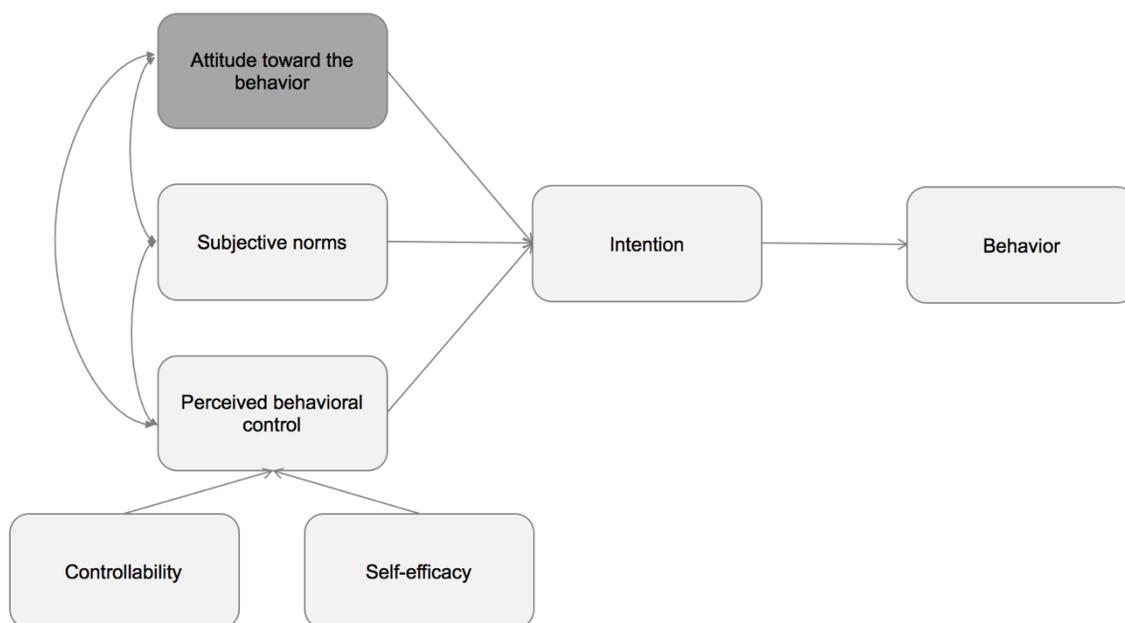


Figure 8. Teacher attitudes as an integral element of the theory of planned behavior.

School-Wide Initiatives Addressing Teacher Attitudes

For this literature synthesis, school-wide initiatives are understood as changes at the student, teacher, and school leadership level, as well as in the school’s systems and structures. The empirical literature on school-wide efforts to improve teacher attitudes toward inclusion in low- and middle-income countries is limited. Existing evidence on school-wide efforts stems from higher-income countries, including a study by Al-Manabri et al. (2013) in Kuwait and by Wilkins and Nietfeld (2004) in the United States. Table 7 provides an overview of key study components, consisting of country information, sample and sample size, overall study design, relevant measures, and intervention strategies for each study.

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Table 7

Methodological Overview of Intervention Studies Using School-Wide Initiatives to Address Teacher Attitudes Toward Inclusion

Authors/ Country	Sample	Overall Study Design	Attitude Measures	Intervention Strategies
Al-Manabri et al. (2013)/ Kuwait	Teachers from 28 regular schools	<ul style="list-style-type: none"> • Mixed methods • Comparison group 	Teacher survey (no details provided)	<ul style="list-style-type: none"> • Lectures • School-based training workshops • Collaborative teaching • School visits • Peer classroom observation
Wilkins and Nietfeld (2004)/ United States	All 89 teachers from four regular schools	<ul style="list-style-type: none"> • Quantitative • Comparison group 	Van Reusen, Shoho, and Barker (2000) teacher survey	<ul style="list-style-type: none"> • Lectures • School-based training workshops • Collaborative teaching • School-wide inclusion action plan

As shown in Table 7, the two studies differ in nearly all aspects of design and instrumentation. Meanwhile, both studies included comparison schools to inform outcomes, rather than adopting a pretest-posttest design. Wilkins and Nietfeld (2004) surveyed various cohorts based on their length of participation in the program. This study used a teacher survey adapted from Van Reusen, Shoho, and Barker (2000), which included a 4-point Likert scale querying attitudinal dimensions related to teacher training, their effectiveness, academic climate, and the social adjustment of students with special needs. Both sets of authors employed similar intervention strategies, including lectures, trainings, and collaborative teaching, but each with additional unique components. Although specifics are lacking on the details of the length of training or detailed content of the training sessions implemented, Al-Manabri et al. (2013) suggest repeated training over the course of 18 months. Wilkins and Nietfeld (2004) specified a total of 50 hours of training delivered over the course of a single school year.

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Findings from these studies indicate mixed results regarding their interventions' efficacy around improving teacher attitudes toward inclusion. Al-Manabri et al. (2013) reported more positive teacher attitudes toward inclusion among teachers in their intervention schools, compared to teachers in comparison schools. In contrast, Wilkins and Nietfield (2004) found significantly more positive teacher attitudes toward inclusion among teachers in the schools newly joining the project, compared to those who had already participated in the intervention for three years. The authors noted several possible explanations including ineffective training methods considering relatively stable attitudinal beliefs as well as a possible lack of buy-in by intervention teachers of the concept of inclusive education (Wilkins & Nietfield, 2004).

Stand-Alone In-Service Teacher Training Addressing Teacher Attitudes

In contrast to the scarcity of intervention literature on co-teaching and school-wide approaches, a robust body of knowledge exists on stand-alone in-service teacher professional development as an approach to improving teacher attitude toward inclusive education. This research comes from low-, middle-, and high-income countries. Table 8 provides an overview of select studies from this body of research, highlighting country information, sample and sample size, overall study design, relevant measures, and intervention strategies for each study. As presented in Table 8, results from these studies are based on convenience samples with either a pretest-posttest design or teacher control group design.

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Table 8

Methodological Overview of Intervention Studies Using Stand-Alone Teacher Training to Address Teacher Attitudes Toward Inclusion

Authors/ Country	Sample	Overall Study Design	Attitude Measures	Intervention Strategies
Kandhari and Chowdhry (2016)/ India	100 teachers from regular schools	<ul style="list-style-type: none"> Quantitative Pretest-posttest 	Newly constructed scale	<ul style="list-style-type: none"> In-person, group-based in-service teacher training Focus on information sharing Group discussions
Kurniawati et al. (2017)/ Indonesia	67 teachers from 11 regular schools (33 intervention, 34 control group)	<ul style="list-style-type: none"> Quantitative Pretest-posttest Teacher control group 	Newly constructed scale	<ul style="list-style-type: none"> In-person, group-based in-service teacher training Focus on information sharing Group discussions Video-enhanced activities
Lifshitz, Glaubman, and Issawi (2004)/ Israel and West Bank	66 teachers from Israel, 192 teachers from the West Bank of whom 125 are regular school teachers, 103 inclusive teachers	<ul style="list-style-type: none"> Quantitative Pretest-posttest 	Gemmel-Crosby and Hanzlik (1994) questionnaire	<ul style="list-style-type: none"> In-person, group-based in-service teacher training Focus on information sharing Group discussions Video-enhanced activities
Sari (2007)/ Turkey	122 teachers from 24 regular schools, (61 intervention, 61 control group)	<ul style="list-style-type: none"> Quantitative Pretest-posttest Teacher control group 	Opinions Relative to Mainstreaming scale	<ul style="list-style-type: none"> In-person, group-based in-service teacher training Focus on information sharing Group discussions
Seçer (2010)/ Turkey	66 preschool teachers from 33 regular preschools	<ul style="list-style-type: none"> Quantitative Pretest-posttest 	Opinions Relative to Mainstreaming scale	<ul style="list-style-type: none"> In-person, group-based in-service teacher training Focus on information sharing Group discussions
Sucuoğlu, Bakkaloğlu, Akalin, Demir, and İşcen-Karasu (2015)/ Turkey	30 preschool teachers from 14 regular pre-schools	<ul style="list-style-type: none"> Quantitative Pretest-posttest 	Opinions Relative to Mainstreaming scale	<ul style="list-style-type: none"> In-person, group-based in-service teacher training Focus on information sharing Group discussions Video-enhanced activities Structured reflection sessions Comprehensive manuals, lesson planning templates

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Researchers used a mix of newly constructed and existing instruments. Illustratively, Kurniawati et al. (2017) developed a new attitude scale with two factors, a cognitive-affective factor and a behavioral factor, to teacher attitudes toward inclusion. Lifshitz, Glaubman, and Issawi (2004) used the Gemmel-Crosby and Hanzlik (1994) questionnaire, which is a 5-factor Likert scale along five categories of disabilities, including physical disabilities, sensory impairments, deafness and blindness, learning disabilities, and behavioral/emotional disabilities. Sari (2007), Seçer (2010), and Sucuoğlu et al. (2015) used the Opinions Relative to Mainstreaming scale. This scale is a 5-factor Likert scale indexing teachers' attitudes along factors such as classroom management, teacher competencies, advantages of inclusion, student competencies and potential, and negative effects of inclusion.

Table 8 also highlights intervention strategies applied in the referenced studies. Interventions all entailed in-person, group-based in-service teacher training with a focus on information sharing and group discussions with select studies featuring additional activities. Additional training delivery activities included video-enhanced activities (Kurniawati et al., 2017; Lifshitz et al., 2004; Sucuoğlu et al., 2015) or structured reflection sessions (Sucuoğlu et al., 2015). The next section discusses findings from the referenced studies in consideration of length and format of the training intervention.

In-service teacher training length and format. Results from this existing body of evidence indicate that high-intensity short-term in-service teacher training with at least 21 hours of contact time over the course of eight days can significantly improve some of the measured aspects of teachers' attitudes toward inclusive education (Sari, 2007). The study by Sari (2007) included a convenience sample of 122 Turkish teachers, half of whom were assigned to a control group. Sari measured teacher attitudes using the Opinions Relative to Mainstreaming scale before and after training. Results from the study presented significant improvements in teachers'

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attitudes on the attitudinal factors related to teachers' competencies for inclusion, as well as their perceived benefits of inclusive education. Sari did not find significant improvements in teacher attitudinal factors related to classroom management, expectations for students' competencies, and negative effects of inclusion. Similarly, mixed results were found in other high-intensity short-term in-service training of 28–30 hours delivered over three to five days (Lifshitz et al., 2004; Seçer, 2010). In this body of research, attitudes also significantly improved on aspects such as perceived benefits of inclusion but not on the classroom management or teacher competency components of the attitude scale (Seçer, 2010).

In contrast, in-service teacher training interventions of similar length, but spaced over longer periods, appear to yield more consistent improvements in teacher attitudes (Kurniawati et al., 2017; Sucuoğlu et al., 2015). In this body of research, the in-service teacher training of 30–48 hours was spread over 4–16 sessions during 8–16 calendar weeks. Although different scales were used to measure teacher attitudes, these studies showed statistically significant improvements on all factors of their attitude scales (Sucuoğlu et al., 2015) or all but one (Kurniawati et al., 2017).

Kurniawati et al. (2017) did not find statistically significant improvements in the behavioral component (i.e., actions toward inclusion) of their attitude scale. The authors suggested that improving knowledge and affective aspects of attitudes may not be sufficient to improve behavioral intentions of teachers. They also identified gaps in their intervention in promoting teacher self-efficacy as a critical component of teachers' behavioral intentions. The authors suggested that external factors such as large class sizes and a lack of resources and teacher support may contribute to lingering concerns about the practical implementation of inclusive education in mainstream classrooms.

Notably, among the three studies using the same or similar instruments to measure regular classroom teachers' attitudes, which took place in the same country (Turkey),

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improvements in teacher attitude appear to have been strongest in the study by Sucuoğlu et al. (2015). In contrast to the studies by Sari (2007) and Seçer (2010), Sucuoğlu et al. (2015) designed their intervention to be delivered over a longer period—a total of 48 hours delivered in sessions of three hours each over 16 weeks—and appeared to have used a wider range of engagement mechanisms, including lectures, discussions, video-based activities, and structured reflection. The next section discusses findings from these studies in consideration of training content.

In-service teacher training content. Concerning the content of training aimed at addressing teacher attitude toward inclusive education, interventions to date included sessions on characteristics of specific disabilities (Kandhari & Chowdhry, 2016; Kurniawati et al., 2017; Seçer, 2010; Sucuoğlu et al., 2015) and individualized education programs (Kurniawati et al., 2017; Seçer, 2010; Sucuoğlu et al., 2015). The focus of training interventions was also on collaboration with school and parent stakeholders (Kurniawati et al., 2017; Seçer, 2010; Sucuoğlu et al., 2015) and issues of policy and legislation in inclusive education (Kandhari & Chowdhry, 2016; Lifshitz et al., 2004). Furthermore, the interventions by Kurniawati et al. (2017), Lifshitz et al. (2004), and Sucuoğlu et al. (2015) specifically included teaching methods and strategies.

Research results indicate that the topics of these studies appear to meet teachers' needs concerning the knowledge components of their attitudes toward inclusive education. Specifically, interventions with a content focus on the characteristics of specific disabilities (Lifshitz et al., 2004) and knowledge of accommodations and teaching strategy (Kurniawati et al., 2017; Lifshitz et al., 2004; Sucuoğlu et al., 2015) appear to yield significant improvements in teachers' attitudes toward inclusive education. Specific training on collaboration with parents also emerged as an important factor shaping teachers' attitudes (Sucuoğlu et al., 2015).

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In summary, among various approaches to improving teacher attitude toward inclusive education such as co-teaching, school-wide efforts, and stand-alone in-service teacher professional development, the latter appears to have the more robust evidence base stemming from a range of country contexts to date. Among the various formats of in-person teacher training, the literature points to the efficacy of programs that are three to four days in length and delivered in various sessions over several weeks to improve teachers' attitude toward inclusive education (Sucuoğlu et al., 2015). Concerning training content, results from this body of knowledge suggest a focus on characteristics of specific disabilities and knowledge of teaching strategies, delivered to include information sharing, group discussions, reflection, and practice to help teachers overcome attitudinal barriers (Kurniawati et al., 2017; Lifshitz et al., 2004; Sucuoğlu et al., 2015). The next section synthesizes the applicable literature on interventions aimed at addressing school climate and subjective norms in inclusive education.

Addressing Subjective Norms in Inclusive Education

Subjective norms are what teachers may perceive as the desirable behaviors in their school and the pressure their context exerts on them to meet these behavioral expectations (Ajzen, 1991). Studied approaches to improving teachers' sense of an inclusive subjective norm and climate in their school include structured school collaborations and school-wide initiatives. Structured collaboration interventions are initiatives that specifically include school leadership and some or all teachers of a school (Deppeler, 2006; Yeung, 2012). School-wide initiatives include school leadership and some or all teachers of a school and involve changing elements of school structure, funding, or service delivery (Abawi, 2015; Katz, 2015; Strieker, Logan, & Kuhel, 2012; White & Shin, 2016). Figure 9 situates the discussion on subjective norms within the larger theory of planned behavior.

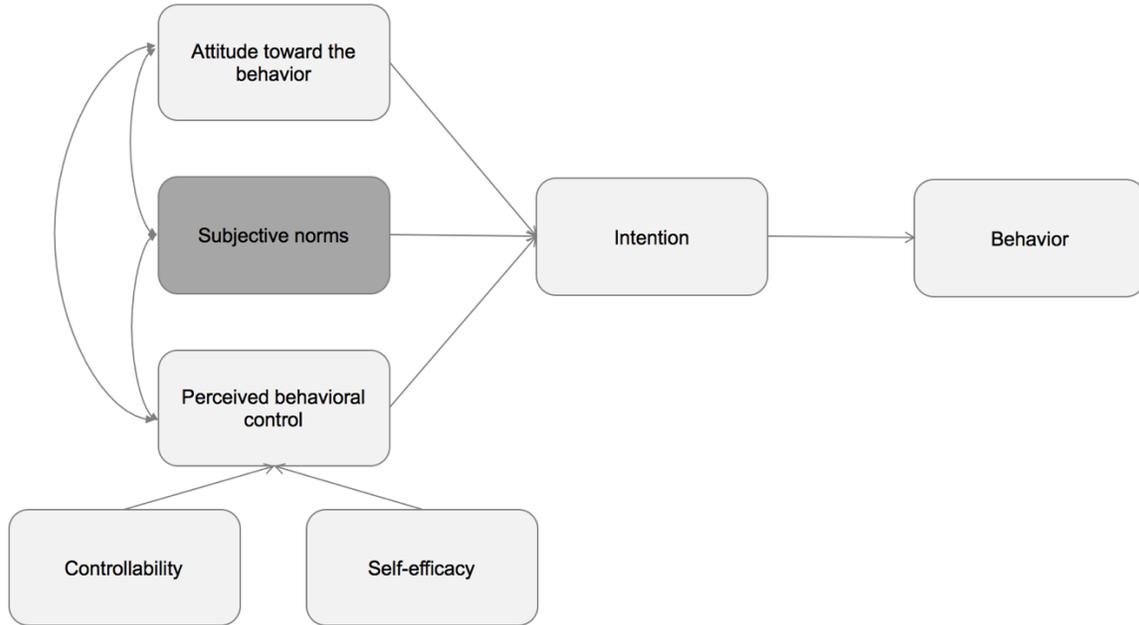


Figure 9. Subjective norms as an integral element of the theory of planned behavior.

School Collaboration Initiatives Addressing Subjective Norms

Research on the use of structured school collaborations to address subjective norms and school climate has been primarily conducted in higher-income country contexts. Table 9 provides an overview of key study components consisting of country information, sample and sample size, overall study design, relevant measures, and intervention strategies for each study.

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Table 9

Methodological Overview of Intervention Studies Using School Collaboration to Address Subjective Norms in Inclusive Education

Authors/ Country	Sample	Overall Study Design	Subjective Norm Measures	Intervention Strategies
Deppeler (2006)/ Australia	45 teachers from eight regular schools	• Mixed methods	Newly constructed teacher survey; document analysis; classroom observations	<ul style="list-style-type: none"> • Recurring school-based training workshops for teachers and principals, delivered by representatives of the collaborating organization • Collaborative inquiry and action research
Yeung (2012)/ Hong Kong	15 teachers from one regular school	• Mixed methods	Newly constructed teacher survey; document analysis; classroom observations semi-structured interviews	<ul style="list-style-type: none"> • Recurring school-based training workshops for teachers and principals, delivered by representatives of the collaborating organization • Cross-school activities with students

As presented in Table 9, both researchers used mixed methods designs, and data were collected through a wide range of measures, including surveys, document analysis, and observation. Specific intervention elements of this collaborative approach to addressing subjective norms and inclusive school culture include medium-term (over 1.5—3 years), recurring school-based professional development workshops for teachers and principals delivered by representatives of the collaborating organization.

Although not generalizable given small sample sizes, findings from these studies indicate that these longer-term collaboration interventions were effective in improving teachers' attitudes, confidence, and skills around inclusive education and their professional collaboration with each other and the outside partners (Deppeler, 2006; Yeung, 2012). The research results further showed increased engagement of parents and the community as well as improvements in overall

school climate and espousal of inclusion (Deppeler, 2006; Yeung, 2012). Findings from these studies also suggest a critical role for school leadership in promoting inclusion (Deppeler, 2006; Yeung, 2012). This factor of school leadership also aligns with aspects of the school-wide initiatives discussed in the next section.

School-Wide Initiatives Addressing Subjective Norms

Research to date on school-wide initiatives to promote an inclusive school culture appears to predominantly come from high-income contexts. This body of evidence is based on long-term (3—10 years) initiatives aimed at changes at the student, teacher, school leadership, and community level, as well as in the overall school system and structures. Table 10 provides an overview of key study components consisting of country information, sample and sample size, overall study design, relevant measures, and intervention strategies for each study.

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Table 10

Methodological Overview of Intervention Studies Using School-Wide Initiatives to Address Subjective Norms in Inclusive Education

Authors/ Country	Sample	Overall Study Design	Subjective Norm Measures	Intervention Strategies
Abawi (2015)/ Australia	12 teachers, 12 parents, 10 students, 2 teacher aides, and 4 external education staff at one regular school	<ul style="list-style-type: none"> • Case study 	Interviews; observations; document reviews	<ul style="list-style-type: none"> • Innovative Designs for Achievements in Schools (IDEAS) process for shared leadership • Visions program entailing values education and behavior reinforcement • Flexible structures for student placement, timetabling, and resource allocation
Katz (2015)/ Canada	58 teachers in 10 regular schools	<ul style="list-style-type: none"> • Mixed methods • Pretest-posttest • Comparison group 	Newly constructed teacher survey; focus groups; classroom and lesson planning session observations	<ul style="list-style-type: none"> • Block Two of Three Block Model of Universal Design for Learning • In-person, group-based in-service teacher training • Lesson planning practice • Professional learning community meetings
Richards, Aguilera, Murakami, and Weiland (2014)/ United States	Qualitative part; staff in five regular schools; quantitative part; 51 schools	<ul style="list-style-type: none"> • Mixed methods • Exploratory case study 	Interviews; observations; document reviews; Benchmark of Quality protocol	<ul style="list-style-type: none"> • Positive Behavior Interventions and Support (PBIS) program • Participatory PBIS leadership team • In-service teacher training • Clearly state expectations for students and staff
White and Shin (2016)/ United Kingdom	10 school leaders, five special educational coordinators, 45 school personnel in five regular schools, plus 123 parents	<ul style="list-style-type: none"> • Mixed methods • Case study • Pretest-posttest • 	Semi-structured interviews; observations; document reviews	<ul style="list-style-type: none"> • Building Schools of Character (BSC) program • In-person, group-based in-service teacher training • Regular character education lessons • Restorative justice program

As indicated in Table 10, mixed methods and case-study approaches are dominant in this body of knowledge, with data collected from surveys (Katz, 2015), interviews (Abawi, 2015;

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Richards et al., 2014), classroom observations (Katz, 2015; Richards et al., 2014), document analysis (Richards et al., 2014), and data extraction (e.g., extracting data from schools' behavior referral systems; White & Shin, 2016). Richards et al. (2014) also employed the Benchmark of Quality protocol, a Texas-wide instrument to measure the quality of the Positive Behavior Intervention and Support program implementation in participating schools. The Benchmark of Quality contains items along key areas of the behavior intervention program, including items on team performance, school staff commitment, disciplinary procedures, school program data management, the school's reward and recognition program, and teaching expectations. The Benchmark to Quality protocol also includes items on the behavior intervention program's implementation plans, classroom systems, and the school's program evaluation work (Richards et al., 2014).

All studies relied on small-scale convenience samples (between 1—10 schools) as their source of data (Abawi, 2015; Katz, 2015; Richards et al., 2014; White & Shin, 2016). Although not generalizable, findings from these studies indicate that whole-school approaches to addressing subjective norms in inclusion are effective in improving school climate (Katz, 2015; White & Shin, 2016), building shared meaning for inclusion among school communities (Abawi, 2015), and optimizing teacher time for personalized teaching and content delivery (Abawi, 2015; White & Shin, 2016). Findings also indicate a shift to needs-based resourcing to help finance inclusive instruction (Abawi, 2015). Furthermore, results suggest changes at the student level, notably reductions in inappropriate behavior and improved self-regulation (White & Shin, 2016), as well as improved student self-efficacy and engagement (Abawi, 2015).

Extending other findings on the crucial role of school leadership in whole-school approaches to inclusion, Richards et al. (2014) further analyzed data collected on principals' focus on the Positive Behavior Intervention and Support program and schools' scores for

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inclusion as measured by the Benchmark of Quality. Their findings indicated a significant positive relationship between a principal's focus on the program and the school's performance on the benchmark protocol. Where principals sustained a strong focus on the program over two to three years and longer, benchmark scores of their schools remained high. Where principals relinquished focus on the program after the first one to two years, schools' benchmark scores were lower. These findings suggest a need to ensure long-term dedication and principal engagement in whole-school approaches to addressing subjective norms in inclusive education (Richards et al., 2014).

In summary, the existing evidence points to the value of two main approaches to improving subjective norms in inclusion in diverse contexts: school collaborations with external partners and school-wide approaches. Findings from indicative studies in these domains highlight their longitudinal nature with at least two to three years of implementation timeframes. Collaborative and school-wide approaches were also marked by challenges in recruiting the sustained engagement of school leadership (Richards et al., 2014) and the outside partner (Deppeler, 2006). Despite the complexities of their long-term implementation, these approaches yielded measurable improvements in teacher professional collaboration, school leadership, and community engagement (Abawi, 2015; Deppeler, 2006; Yeung, 2012). Complementing the evidence base on teachers' attitudes and subjective norms, the next section synthesizes research exploring teachers' perceived behavioral control, specifically their self-efficacy for inclusive instruction.

Addressing Teachers' Behavioral Control and Self-Efficacy for Inclusive Education

Approaches to addressing teachers' behavioral control and specifically their self-efficacy for inclusive instruction include collaborative consultation (DeVore, Miolo, & Hader, 2011; Dinnerbeil, Spino, & McInerney, 2011; Goetz, 2001; Miller, Wienke, & Savage, 2000) and

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stand-alone, short-term in-service teacher professional development (Chao, Chow, Forlin, & Ho, 2017; Chao, Forlin, & Ho, 2016; Forlin & Sin, 2010; Owens-Twaites, 2013). As discussed earlier, drawing on Ajzen (1991), self-efficacy in this context refers to teacher's confidence in their ability to adopt inclusive instructional behaviors. Self-efficacy is one element of behavioral control, together with a teachers' sense of controllability of the contextual factors that affect their ability to adopt inclusive practices. Such contextual factors may include timetables, student assessment, class size, and access to relevant materials. Figure 10 situates the discussion on behavioral control and specifically teacher self-efficacy within the larger theory of planned behavior.

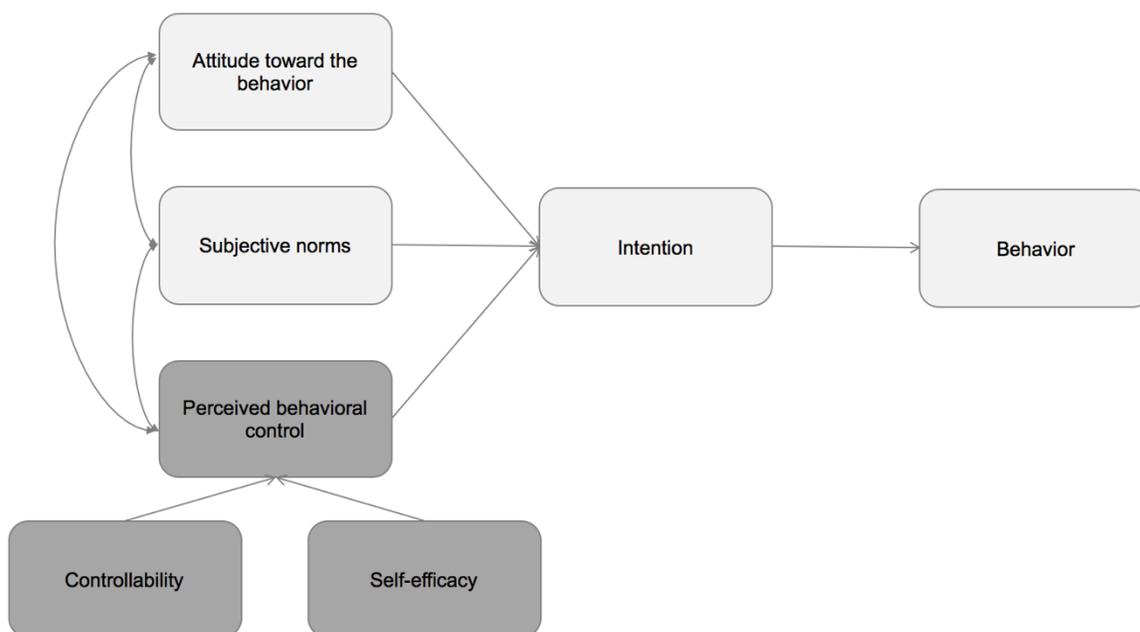


Figure 10. Behavioral control and self-efficacy as an integral element of the theory of planned behavior.

Collaborative Consultation Initiatives Addressing Teacher Self-Efficacy

Collaborative consultation entails inclusive education specialists conducting regular school visits to an assigned number of schools to provide support to regular teachers in inclusive classrooms (Miller et al., 2000). This approach already exists in several low- and middle-income

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countries, including Ethiopia, as an itinerant teacher model (Lynch, McCall, Douglas, McLinden, et al., 2011; Lynch, McCall, Douglas, McLinden, & Bayo, 2011), as well as in higher-income countries (DeVore et al., 2011; Dinnerbeil et al., 2011; Goetz, 2001). Though not generalizable (and lacking also pretest-posttest or comparison group designs), results from existing research on the itinerant teacher model in East Africa indicate challenges with implementation. Researchers found that itinerant teachers face a high caseload (and may travel long distances to schools) and may not be adequately trained to identify disabilities and design accommodated learning environments (Lynch, McCall, Douglas, McLinden, et al., 2011; Lynch, McCall, Douglas, McLinden, & Bayo, 2011). They also lack access to specialized materials in support of student identification and support (Lynch, McCall, Douglas, McLinden, et al., 2011; Lynch, McCall, Douglas, McLinden, & Bayo, 2011). Researchers further report systemic challenges relating to a lack of clarity in roles and responsibilities and overall low resource provision within the itinerant teacher model (Lynch, McCall, Douglas, McLinden, et al., 2011; Lynch, McCall, Douglas, McLinden, & Bayo, 2011; MOE, 2016b).

Rigorous empirical intervention studies (with comparison groups or pretest-posttest designs) on collaborative consultation to date come from higher-income countries. Notably, such research stems predominantly from the United States (DeVore et al., 2011; Dinnerbeil et al., 2011; Goetz, 2001; Miller et al., 2000). Given the limitation in contexts in which collaborative consultation research has taken place, this literature synthesis explores stand-alone in-service teacher professional development as a potentially more viable approach to addressing teachers' self-efficacy for inclusive instruction.

In-Service Teacher Training Addressing Teacher Self-Efficacy

Stand-alone in-service teacher professional development as an intervention approach to addressing teacher self-efficacy for inclusive education enjoys a robust evidence base from a

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range of contexts (Chao, Forlin, & Ho, 2016; Chao et al., 2017; Forlin & Sin, 2010; Lifshitz et al., 2004; Owens-Twaites, 2013). Table 11 provides an overview of key study components, consisting of country information, sample and sample size, overall study design, relevant measures, and intervention strategies for each study.

Table 11

Methodological Overview of Intervention Studies Using Stand-Alone In-Service Teacher

Training to Address Self-Efficacy for Inclusion

Authors/ Country	Sample	Overall Study Design	Self-Efficacy Measures	Intervention Strategies
Chao et al. (2016)/ Hong Kong	417 regular school teachers	<ul style="list-style-type: none"> • Mixed Methods • Pretest-posttest 	Teacher Efficacy for Inclusive Practices scale; focus groups	<ul style="list-style-type: none"> • In-person, group-based in-service teacher training • Focus on information sharing • Group discussions
Chao et al. (2017)/ Hong Kong	347 regular school teachers	<ul style="list-style-type: none"> • Quantitative • Pretest-posttest 	Teacher Sense of Efficacy Scale (12-item adapted)	<ul style="list-style-type: none"> • In-person, group-based in-service teacher training • Focus on information sharing • Group discussions
Forlin and Sin (2010)/ Hong Kong	517 regular school teachers	<ul style="list-style-type: none"> • Quantitative • Pretest-posttest 	Teacher Efficacy for Inclusive Practices scale	<ul style="list-style-type: none"> • In-person, group-based in-service teacher training • Focus on information sharing • Group discussions • Reflections and practical assignments
Lifshitz et al. (2004)/ Israel and West Bank	66 teachers from Israel, 192 teachers from the West Bank of whom 125 are regular school teachers, 103 inclusive teachers	<ul style="list-style-type: none"> • Quantitative • Pretest-posttest 	Gemmel-Crosby and Hanzlik (1994) questionnaire	<ul style="list-style-type: none"> • In-person, group-based in-service teacher training • Focus on information sharing • Group discussions • Video-enhanced activities

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Owens-Twaites, (2013)/ United States	25 teachers	<ul style="list-style-type: none"> • Quantitative • Pretest-posttest 	Teacher Sense of Efficacy Scale (24-item)	<ul style="list-style-type: none"> • In-person, group-based in-service teacher training • Focus on information sharing • Group discussions • Discussion of baseline results of teacher self-efficacy • Books
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As indicated Table 11, researchers addressing teacher self-efficacy predominantly used existing scales for measurement. The Teacher Efficacy for Inclusive Practices scale is an 18-item Likert scale with three factors: teacher self-efficacy for using inclusive instruction, teacher self-efficacy for managing behavior, and teacher self-efficacy for working collaboratively (Chao et al., 2016; Forlin & Sin, 2010). The Teacher Sense of Efficacy Scale used in Chao et al.'s (2017) study in Hong Kong was adapted to the context as a 12-item Likert scale with two factors: teacher self-efficacy for teaching and learning and teacher self-efficacy for classroom management. This scale, however, was not specific to inclusive education, which the authors mentioned as a study limitation given other research indicating that teacher self-efficacy may be a context- and domain-specific construct (Chao et al., 2017). The Teacher Sense of Efficacy Scale used by Owens-Twaites (2013) is the original 24-item Likert scale version with three factors: teacher efficacy for student engagement, teacher efficacy for instructional practices, and teacher efficacy for classroom management. The self-efficacy component of the Gemmel-Crosby and Hanzlik (1994) questionnaire used in Lifshitz et al. (2004) is a 5-factor Likert scale with five categories of disabilities: physical disabilities, sensory impairments, deafness and blindness, learning disabilities, and behavioral/emotional disabilities.

In-service teacher training length and format. Results from the current body of knowledge indicate that high-intensity short-term in-service teacher training with 28—30 hours of contact time delivered over the course of three to five consecutive days in a mix of lecture and group discussions can significantly improve some teachers' self-efficacy for inclusive education

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(Forlin & Sin, 2010; Lifshitz et al., 2004). At this level of intensity, several studies yielded statistically significant improvements on all dimensions of teacher self-efficacy and across instruments (Chao et al., 2016; Chao et al., 2017; Forlin & Sin, 2010; Lifshitz et al., 2004). In contrast, the U.S. intervention by Owens-Twaites (2013), which was implemented in 12 sessions over three months, did not result in statistically significant improvements in teachers' self-efficacy on any of the factors measured by the Teacher Sense of Efficacy Scale. To explain these findings, Owens-Twaites (2013) suggested that teachers may have already felt high degrees of confidence because of other ongoing teacher training activities, which may have limited the effectiveness of the intervention. The next section discusses findings from the referenced studies in consideration of the content of their training interventions.

In-service teacher training content. Findings across studies indicate the efficacy of teacher training that entails sessions on policy and legislation, student identification, and practical strategies for inclusive instruction (Chao et al., 2016; Chao et al., 2017; Forlin & Sin, 2010; Lifshitz et al., 2004). The study by Owens-Twaites (2013), which failed to show significant gains in participating teachers' self-efficacy, included four sessions discussing student outcomes, teacher self-efficacy baseline outcomes, and scheduling and planning issues for inclusive education. Furthermore, three different sessions were focused on the history of inclusion, components of inclusion, and components of co-teaching. The intervention appears to have featured in three out of 12 sessions student identification, strategies for differentiated instruction, and teacher observation and reflection.

Owens-Twaites's (2013) study contrasts with the training content focus by Forlin and Sin (2010), Chao et al. (2017), and Chao et al., (2016), which prioritized teachers' in-depth understanding of students' learning needs and the practical application of inclusive strategies and skills (although these studies did not provide data on specific time-allocations per topic). This

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body of research notably reported statistically significant gains in teacher self-efficacy, different to Owens-Twaites (2013).

In summary, approaches in the empirical literature aimed at improving teacher self-efficacy for teaching in inclusive education in diverse contexts include collaborative consultation (Miller et al., 2000) and stand-alone short-term in-service teacher professional development (Chao et al., 2016; Lifshitz et al., 2004; Owens-Twaites, 2013). The evidence base for short-term teacher training is more robust to date, stemming from a range of country contexts, and contrasts with the earlier-reported mixed results from utilizing this intervention approach in addressing teachers' attitudes toward inclusive education, where training delivered over longer periods of time appeared more effective.

Yet, the referenced studies focused on self-efficacy suggest that programs that are three to four days in length, even if delivered as a one-time multi-day training, may lead to significant gains in teacher self-efficacy for inclusive instruction (Chao et al., 2016; Chao et al., 2017; Forlin & Sin, 2010; Lifshitz et al., 2004), at least in the short term. Training content and delivery format, however, appear to play a role in promoting teacher self-efficacy, and suggest a focus on policy and legislation, student identification, and practical strategies for inclusive instruction (Chao et al., 2016; Chao et al., 2017; Forlin & Sin, 2010; Lifshitz et al., 2004).

The previous sections considered the existing evidence base on interventions that address teacher attitudes, subjective norms, and self-efficacy in inclusive education. In view of the theory of planned behavior, these aspects might shape behavioral intentions, that is, a person's intent to carry out the behavior. This intent, in turn, is an essential predecessor for the actual execution of the behavior. Hence, the next section sheds light on teachers' behavioral intentions toward inclusive education and how they might manifest in measurable improvements in the adoption of inclusive practices in their classrooms.

Addressing How Teacher's Behavioral Intentions Manifest in Inclusive Practices

In the literature, approaches to addressing teachers' behavioral intentions, that is, their willingness to implement inclusive education, predominantly include various forms of stand-alone teacher training. These forms of professional development include online or hybrid in-service training initiatives to promote inclusive lesson planning (Baldiris Navarro, Zervas, Fabregat Gesa, & Sampson, 2016; Courey, Tappe, Siker, & LePage, 2013; McGhie-Richmond & Sung, 2013).

No researchers to date, however, appear to have implemented online or hybrid approaches measuring teachers' intentions (usually in the form of lesson plans) or teachers' resulting behavior in the classroom. This additional lens can be found in studies in which other approaches were taken, notably stand-alone in-person in-service teacher training (Elder et al., 2016; Hundert, 2007; Katz, 2015; Sucuoğlu et al., 2015) or in-person training with performance feedback strategies (Akalin & Sucuoğlu, 2015; Brown, Gatmaitan, & Harjusola-Webb, 2014; Duchaine, Jolivette, & Fredrick, 2011). Figure 11 situates the discussion on teachers' behavioral intentions and practices within the larger theory of planned behavior.

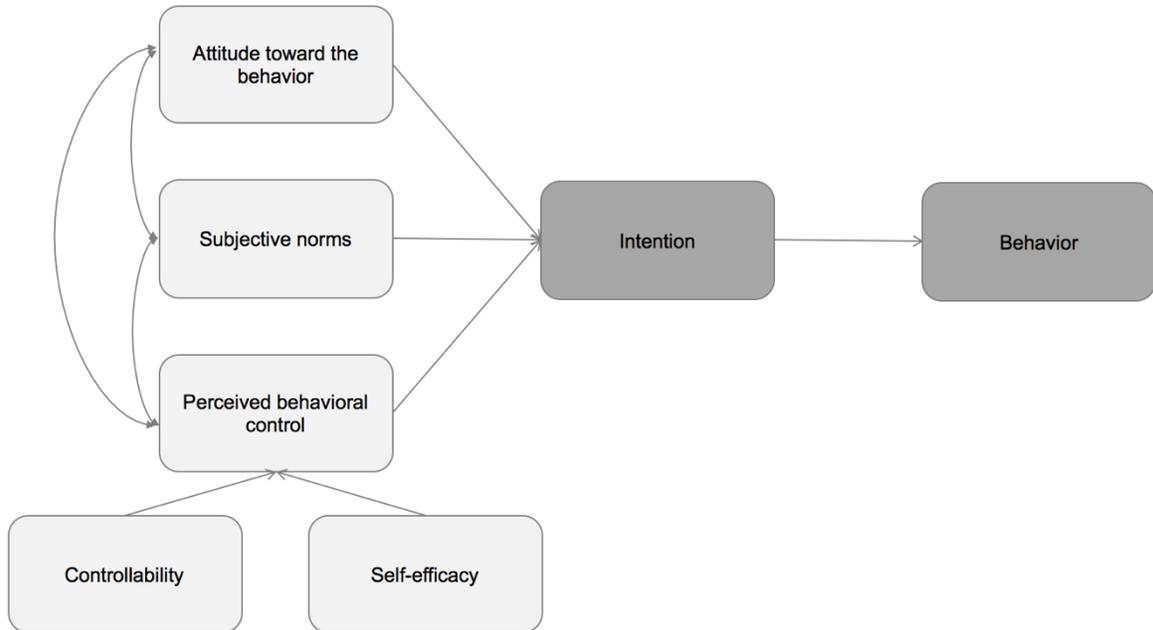


Figure 11. Behavioral intention and behavior as integral elements of the theory of planned behavior.

Online or Hybrid Teacher In-Service Training Addressing Teachers’ Intentions

The empirical evidence on using online or hybrid teacher in-service training as an approach to addressing teachers’ behavioral intentions in inclusive education is informed by studies from predominantly middle- and higher-income countries. Table 12 provides an overview of key study components consisting of country information, sample and sample size, overall study design, relevant measures, and intervention strategies for each study.

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Table 12

Methodological Overview of Intervention Studies Using Online or Hybrid In-Service Training to Address Teachers' Intentions

Authors/ Country	Sample	Overall Study Design	Behavioral Intention Measures	Intervention Strategies
Baldiris Navarro et al. (2016)/ Colombia	47 regular school teachers in three cohorts	<ul style="list-style-type: none"> Quantitative Pretest- posttest 	Spooner et al. (2007) lesson rubric	<ul style="list-style-type: none"> Hybrid (part online, part in-person teacher training)
Courey et al. (2013)/ United States	45 regular school teachers	<ul style="list-style-type: none"> Quantitative Pretest- posttest 	Newly constructed lesson rubric	<ul style="list-style-type: none"> Fully online teacher training
McGhie- Richmond and Sung (2013)/ Canada	10 regular school teachers	<ul style="list-style-type: none"> Mixed methods Pretest- posttest 	Spooner et al. (2007) lesson rubric; document analysis	<ul style="list-style-type: none"> Fully online teacher training

Researchers from the referenced studies utilized different methods to assess changes in inclusive lesson design, but all built on the Universal Design for Learning (UDL) framework. UDL is based on the understanding that individual variability is not an exception but a representation of natural human diversity (CAST, 2011). In this sense, CAST (2011) indicated, “because most curricula are unable to adapt to individual variability, we have come to recognize that curricula, rather than learners, are disabled, and thus we need to ‘fix’ curricula not learners” (p. 1). The three UDL principles are (a) provide multiple means of representation, (b) provide multiple means of action and expression, and (c) provide multiple means of engagement (CAST, 2011). With that UDL lens, researchers from the referenced studies focused on teacher capacity in designing lessons that promote the three UDL principles (Baldiris Navarro et al., 2016; Courey et al., 2013; McGhie-Richmond & Sung, 2013).

The Spooner et al. (2007) rubric applied in two of the studies listed in Table 12 entails a 3-point scale (0 = no clear description of instructional modification provided in the lesson plan; 1 = one or more instructional modifications provided; 2 = three or more instructional modifications

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provided) along the three main UDL principles of representation, expression, and engagement (Baldiris Navarro et al., 2016; Courey et al., 2013). The rubric has a maximum score of 6 for lesson plans that featured three or more instructional modifications on each of the three UDL dimensions. Baldiris Navarro et al. (2016) conducted such quantitative analysis of lesson plan modifications for two lesson plans per participating teacher in their study, one at baseline and one at endline. Courey et al. (2013) applied the rubric three times, once at baseline, once directly after the training intervention, and once at endline.

The self-developed instrument by McGhie-Richmond and Sung (2013) similarly quantified the number of changes related to UDL principles, but did so in absolute terms by principle. For example, a teacher who made a total of four changes in line with the UDL principle of multiple means of representation, scored a total of four points on this dimension. In addition to their quantitative analysis of at least two lesson plans per teacher, one at baseline and one at endline, McGhie-Richmond and Sung (2013) also qualitatively analyzed a two-page teacher reflection assignment. The analysis aimed to reveal potential themes in teachers' articulation of the instructional changes they made in their lesson plans and teachers' application of UDL principles. The next section discusses findings from the referenced studies in consideration of training length and format.

Online/hybrid in-service teacher training length and format. Training interventions ranged from participation in one online course of three hours' total duration (Courey et al., 2013) to one online course over the duration of one semester (McGhie-Richmond & Sung, 2013). The hybrid intervention consisted of 18 hours of in-person training and 12 hours of online training delivered over the course of two calendar months (Baldiris Navarro et al., 2016). Although not generalizable given the small sample sizes, results from these studies indicate that the online/hybrid teacher training format, starting at three hours of training time and with at least two

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calendar months between baseline and endline data collection, supported teachers in making measurable changes in lesson plan design (Baldiris Navarro et al., 2016; Courey et al., 2013; McGhie-Richmond & Sung, 2013). Across studies, teachers increased the number of relevant instructional modifications in line with UDL principles between baseline and endline data collection (Baldiris Navarro et al., 2016; Courey et al., 2013; McGhie-Richmond & Sung, 2013).

Although the studies were implemented in different contexts, results from studies using the same measurement tool to evaluate instructional changes suggest that participating teachers in the hybrid intervention (with a total of 30 hours of training implemented over two month; Baldiris Navarro et al., 2016) showed greater gains in the number of relevant instructional modifications in their lesson plans between baseline and endline data collection than the participants in the online condition (with three hours of total training time) did (Courey et al., 2013). The next section discusses findings from these studies in consideration of their training content.

Online/hybrid in-service teacher training content. Concerning the content of the two interventions, the referenced studies both were built on UDL as a conceptual framework to inform training content. The interventions included an introduction to UDL, its main principles, and its application in lesson planning. In both interventions, researchers provided some form of template or guidelines for inclusive lesson design. The online delivery platforms and course designs modeled UDL principles by including a range of content presentation formats such as video and audio (Courey et al., 2013) or including discussion forums for peer support and multiple forms of action and expression (Baldiris Navarro et al., 2016). In addition, the hybrid intervention featured sessions on how to design accessible open educational resources and how to validate them against standard accessibility guidelines (Baldiris Navarro et al., 2016). In their training intervention, McGhie-Richmond and Sung (2013) integrated more general content on

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inclusive education and the needs of special needs students in regular classrooms. This intervention had a strong focus on participants' independent discovery of the efficacy of UDL and reflections on their lesson plans.

Results from this body of literature suggest that online or hybrid in-service teacher training with a strong focus on UDL principles, combined with explicit templates for lesson planning, appears to be effective in increasing teachers' behavioral intentions toward inclusive education. Given the large discrepancies in contact time (30 hours versus three hours), potentially related variances in course content, and differences in measurement in this small body of research, results from these studies are not conclusive on what value additional content areas (i.e., skills in developing lesson plans as standards-based open education resources and general content on inclusive education and special needs education) may have added in increasing teachers' intentions toward inclusive education. Meanwhile, the literature on stand-alone in-person in-service teacher training to increase teachers' intentions and their actual adoption of inclusive instructional practices, as presented in the next section, appears more comprehensive.

In-Person In-Service Training Addressing Teachers' Adoption of Inclusive Practices

The empirical evidence on various forms of stand-alone in-person in-service teacher training to addressing teachers' intentions toward inclusive education and their actual adoption of inclusive instruction practices stems from low and higher-income countries. Table 13 provides an overview of key study components consisting of country information, sample and sample size, overall study design, relevant measures, and intervention strategies for each study.

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Table 13

Methodological Overview of Intervention Studies Using In-Person In-Service Training to Address Teachers' Adoption of Inclusive Practices

Authors/ Country	Sample	Overall Study Design	Behavior Adoption Measures	Intervention Strategies
Elder et al. (2016)/ Kenya	13 regular school teachers, five principals	<ul style="list-style-type: none"> • Mixed methods • Pretest-posttest 	Informal classroom observations	<ul style="list-style-type: none"> • In-person, group-based in-service teacher training • Focus on community-building and instructional strategies • Structured reflection
Hundert (2007)/ United States	Four regular school teachers	<ul style="list-style-type: none"> • Mixed methods • Multiple baseline design 	Eco-Behavioral System for Complex Assessments of Pre-school Environments	<ul style="list-style-type: none"> • In-person pair training via teacher supervisor • Comprehensive manuals, lesson planning templates
Katz (2015)/ Canada	58 teachers in 10 regular schools	<ul style="list-style-type: none"> • Mixed methods • Pretest-posttest • Comparison group 	Newly constructed teacher self-report surveys	<ul style="list-style-type: none"> • Block 2 of Three Block Model • In-person, group-based in-service teacher training • Lesson planning practice • Professional learning community meetings
Sucuoğlu et al. (2015)/ Turkey	30 preschool teachers from 14 regular preschools	<ul style="list-style-type: none"> • Quantitative • Pretest-posttest 	Classroom observations	<ul style="list-style-type: none"> • In-person, group-based in-service teacher training • Focus on information sharing • Group discussions • Video-enhanced activities • Structured reflection sessions • Comprehensive manuals, lesson planning templates

Although in most of the studies referenced in Table 13 researchers conducted their post-intervention classroom observation data collection immediately or within days of the intervention (Elder et al., 2016; Sucuoğlu et al., 2015), Hundert (2007) implemented a multiple baseline design with an additional data collection after three months to investigate potential maintenance effects. Hundert (2007) leveraged items from the Eco-Behavioral System for Complex Assessments of Pre-school Environments (Carta, Greenwood, & Atwater, 1986, as cited in Hundert, 2007), which included observational items for teacher behavior, such as their

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physical proximity to children with or without disabilities during instruction, and their verbal and nonverbal behavior toward student groups with or without children with a disability.

Observational measures newly developed by Elder et al. (2016) and Katz (2015) similarly indexed teacher behaviors, notably their student engagement and grouping strategies. New measures also indexed teachers' approving or disapproving behaviors toward students with disabilities (Sucuoğlu et al., 2015) or teachers' creation of learning opportunities for these students (e.g., questioning; Sucuoğlu et al., 2015).

Although some training was group-based (Elder et al., 2016; Katz, 2015; Sucuoğlu et al., 2015), in one intervention, training included pairs of teachers co-teaching a single classroom (Hundert, 2007). Teacher supervisors, rather than researchers, conducted the teacher training in the study by Hundert (2007), and Elder et al. (2016) included school principals in the teacher training delivered by the authors. The next section discusses findings from the referenced studies in consideration of their training length and format.

In-person in-service teacher training length and format. Training interventions ranged from 2.25 hours of total training time (Hundert, 2007) to 48 hours of total training time (Sucuoğlu et al., 2015). All training was delivered in a spaced format, featuring three sessions (Hundert, 2007), four sessions (Elder et al., 2016; Katz, 2015), and up to 16 training sessions (Sucuoğlu et al., 2015) over a timeframe of 2–16 weeks (Hundert, 2007; Sucuoğlu et al., 2015). Katz (2015) spaced 2.5 days of in-service teacher training over four training sessions but also included one-on-one sessions as well as monthly follow-up meetings to encourage the formation of a professional learning community among participating teachers.

Although not generalizable given the small sample sizes, results from these studies suggest that in-person in-service teacher training starting at 2.25 hours in duration, delivered in several sessions over at least two weeks, can measurably improve teachers' adoption of inclusive

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instructional practices. The referenced studies showed statistically significant gains in teachers' adoption of select inclusive instructional practices, but not all. Illustratively, Katz (2015) noticed a significant shift in instructional time spent on differentiated tasks versus non-differentiated tasks, as well as increases in time spent in small group instruction. On average, whole-class instruction decreased from 35 minutes to five minutes between baseline and endline in a 60-minute lesson (Katz, 2015).

Similarly, Hundert (2007) found that teachers increased the time they spent with student groups containing a child with a disability during playtime sixfold between baseline and immediately following the training. The author suggested that the inclusion of the teachers' supervisors as teacher trainers as a core design element of the intervention might have been central to these gains. It is also noteworthy that this intervention had features of a co-teaching approach—the study included pairs of teachers (one classroom teacher and a part-time resource teacher responsible for Individualized Education Plan, or IEP, development), rather than individual classroom teachers. However, despite these promising findings, Hundert (2007) did not find gains on all observed teacher behaviors.

Sucuoğlu et al. (2015) found measurable (but not statistically significant) increases in teachers' interactions with children with special needs as well as in teacher actions that provide learning opportunities for these students. Conversely, the researchers registered decreases in teacher praise for social behaviors of children with special needs (Sucuoğlu et al., 2015).

Sucuoğlu et al. (2015) discussed their results:

This finding seems to confirm the conclusions of the existing literature which emphasized that education programs featuring hands-on experience, consultancy, and feedback can result in more positive changes on teacher behaviors (Crane-Mitchell & Hegde, 2007; Hundert, 2007). If the PIP [the training program] used in this study had included

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opportunities for hands-on experiences and feedback for the teachers, more changes might have been seen. (p. 335)

The mixed results found by Hundert (2007), on the other hand, might be explained in an examination of the content of the teacher training sessions, as described in the next section.

In-person in-service teacher training content. Concerning the content focus of the referenced interventions, Katz (2015) and Elder et al. (2016) drew on UDL as a conceptual or guiding framework. These interventions included either explicit or implicit content elements on UDL principles and the use of practical teaching strategies and inclusive lesson planning to better meet diverse students' needs. In addition, Elder et al. (2016) focused on community-building strategies and a training design that promoted indigenous knowledge and a sense of empowerment among teachers. The training by Sucuoğlu et al. (2015) focused on a range of topics—from policy issues on inclusive education, to identification and characteristics of students with specific disabilities, IEPs, inclusive teaching strategies, and classroom management—and included sessions on communication skills and working with families as well. Conversely, the training by Hundert (2007) prioritized teacher behavior and activities (e.g., organizational and material arrangements for inclusive group work) that promote peer interaction during play sessions.

As outlined earlier in this section, results from this body of evidence, although limited by small sample sizes, appear to be mixed regarding improvements in teachers' adoption of inclusive instructional practices in their classrooms. Illustratively, despite the previously gains in teachers' inclusive instructional practices directed at inclusive student groups in the classroom, Hundert (2007) did not find increases in teacher behaviors that focused on individual students with disabilities. The author does not provide a discussion of this finding, but it might be explained by the narrow focus of the training intervention on peer interaction.

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Elder et al. (2016) on the other hand, reported that, following their four training sessions drawing on the UDL framework and including the practice of a range of instructional strategies, teachers' adoption of inclusive instructional practices also resulted in increased engagement by students without disabilities. The authors suggested that “universally designed and inclusive strategies benefit all students in the class, not only students with disabilities” (Elder et al., 2016, p. 424). Similarly, participating teachers in the study by Katz (2015) reported decreases in students' challenging behaviors, increases in peer interaction, and overall improvements in class and school climate following their adoption of UDL principles for lesson design and implementation.

Training With Performance Feedback Addressing Teachers' Inclusive Practices

The empirical evidence on teacher training with performance feedback as an approach to addressing teachers' inclusive practices stems from research in Turkey (Akalin & Sucuoğlu, 2015) and the United States (Brown et al., 2014; Duchaine et al., 2011). Performance feedback in this context is defined as a “method in which knowledge about the processes and results is offered to support the transfer or maintenance of knowledge and behaviors” (Akalin & Sucuoğlu, 2015, p. 741). Although the performance feedback was delivered differently across studies, focus on feedback that is descriptive, corrective, and positive and is delivered regularly either during or shortly following observation was found to be key (Akalin & Sucuoğlu, 2015). Table 14 provides an overview of key study components consisting of country information, sample and sample size, overall study design, relevant measures, and intervention strategies for each study.

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Table 14

Methodological Overview of Intervention Studies Using Performance Feedback to Address Teachers' Adoption of Inclusive Practices

Authors/ Country	Sample	Overall Study Design	Behavior Adoption Measures	Intervention Strategies
Akalin and Sucuoğlu (2015)/ Turkey	Three regular school teachers	<ul style="list-style-type: none"> • Mixed methods • Repeated observations 	In person classroom observations; Preventive Classroom Management Observation Form	<ul style="list-style-type: none"> • Short initial in-service teacher training sessions • Weekly 10-minute feedback session by author
Brown et al. (2014)/ United States	One regular school teacher	<ul style="list-style-type: none"> • Mixed methods • Repeated observations 	In person classroom observations with video	<ul style="list-style-type: none"> • Short initial in-service teacher training sessions • Peer feedback from main classroom teacher one to two times per week for 15–20 minutes
Duchaine et al. (2011)/ United States	Three regular school teachers	<ul style="list-style-type: none"> • Mixed methods • Repeated observations 	In person classroom observations with video	<ul style="list-style-type: none"> • Short initial in-service teacher training sessions • Weekly written feedback for teachers' self-study; five-minute in-person performance feedback sessions every three weeks

Two of the referenced studies in Table 14 included new instruments for their purpose (Brown et al., 2014; Duchaine et al., 2011). Akalin and Sucuoğlu (2015) built on the Preventive Classroom Management Observation Form developed in a previous study by one of the authors (Akalin [n.d.] as cited in Akalin & Sucuoğlu, 2015). Instruments predominantly quantified the frequency with which participating teachers utilized targeted behaviors for the duration (15–20 minutes) of the observation (Akalin & Sucuoğlu, 2015; Brown et al., 2014; Duchaine et al., 2011). Two of the studies further indexed teacher classroom management strategies (Akalin & Sucuoğlu, 2015) or student on-task behaviors (Duchaine et al., 2011).

Targeted teacher behaviors differed from study to study. Akalin and Sucuoğlu (2015) targeted teachers' classroom management behaviors promoting individualization, transitions, and

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reinforcement, as well as teachers' approval behaviors. Brown et al. (2014) only focused on naturalistic communication-promoting strategies between the participating teacher and students with disabilities. Similarly, Duchaine et al. (2011) specifically targeted teachers' behavior-specific praise statements. The next section discusses findings from the referenced studies in consideration of training length and format.

Performance feedback training and feedback session length and format. This body of evidence is characterized by diversity in delivery formats of performance feedback as an approach to teacher behavior change. All referenced interventions took place over several months up to 14 weeks in total (Duchaine et al., 2011). The interventions included one or more short (40–45 minutes) initial training sessions combined with regular feedback sessions of 5–20 minutes in length (Akalin & Sucuoğlu, 2015; Brown et al., 2014; Duchaine et al., 2011).

Across studies, researchers used the initial training sessions to set the stage for the implementation of the chosen performance feedback implementation approach, introduced the targeted behaviors, provide examples of successful strategy implementation, and address participant questions (Akalin & Sucuoğlu, 2015; Brown et al., 2014; Duchaine et al., 2011). In addition, the intervention by Duchaine et al. (2011) included specific goal-setting activities that required participants to set their own goals for the frequency with which they aimed to implement the targeted behaviors. Training sessions were accompanied by presentations and manuals across all three studies (Akalin & Sucuoğlu, 2015; Brown et al., 2014; Duchaine et al., 2011).

Duration and frequency of performance feedback sessions were similar across the referenced studies. Akalin and Sucuoğlu (2015) provided six such sessions, one per week, to each participating teacher for the duration of the study. The research by Brown et al. (2014) implemented the peer feedback sessions also over several weeks. In addition to the regular

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observation sessions, Duchaine et al. (2011) studied potential maintenance effects. The authors conducted two additional classroom observations, one two weeks and one three weeks after the last in-person performance feedback session.

Findings from this body of research suggest that performance feedback, following at least one initial training session of 40 minutes or more and implemented weekly over the course of at least one month, is an effective strategy to promote teacher behavior change for targeted inclusive behaviors. However, researchers from only two of the studies reported data on quantitative changes in teacher behavior, and they used different data analysis and reporting approaches (Akalin & Sucuoğlu, 2015; Duchaine et al., 2011).

Furthermore, given the referenced studies' small samples and differences in context, design, and instrumentation, reported gains in teachers' adoption of targeted behaviors could not be compared across studies. Nevertheless, the researchers from two of the studies also assessed related student outcomes. Although Duchaine et al. (2011) reported a measurable increase in teachers' adoption of behavior-specific praise statements, the result did not translate into measurable changes in students' on-task behavior. The researchers noted this finding as contrary to the current research base in this domain but suggested it was due to the narrow focus of the intervention content. Neither the initial training nor the regular performance feedback sessions focused on strategies to promote student on-task behavior (Duchaine et al., 2011).

In contrast, Akalin and Sucuoğlu (2015) found increases in teachers' adoption of correct individualization, transition, and rewarding strategies in their inclusive classrooms, as well as measurable changes on two aspects of student outcomes. The researchers reported measurable increases in positive behavior among the three focal students in participating teachers' classrooms as well as increases in their academic engagement (Akalin & Sucuoğlu, 2015). The

next section discusses findings from the referenced studies in consideration of the content of the performance feedback sessions.

Performance feedback session content. Feedback session content differed across the referenced studies, but all the studies included graphs displaying the observed frequency of the targeted behaviors. In all feedback sessions, the researchers also provided verbal explanation of the graphs, highlighted example behaviors observed, and gave a verbal reward to participating teachers (Akalin & Sucuoğlu, 2015; Brown et al., 2014; Duchaine et al., 2011). Akalin and Sucuoğlu (2015), focused not only on the frequency of adoption of the targeted behaviors but also on their accuracy of implementation; their feedback sessions provided corrective verbal guidance on targeted behaviors not implemented correctly. Alternatively, performance feedback sessions in the Brown et al. (2014) study entailed joint review and discussion of video sequences from the observation with the participating teacher. Duchaine et al. (2011) provided written performance feedback following every observation, even outside of the scheduled in-person feedback sessions.

Results from this body of knowledge suggest that weekly performance feedback in the form of a graph mapping key behavioral data points, accompanied by verbal explanation and discussion, is an effective way to increase teachers' adoption of a diverse range of inclusive instructional practices. Where studies used additional content or strategies for performance feedback, differences in study instrumentation and context does not allow for a more nuanced comparison of findings.

In summary, the empirical literature on addressing teachers' behavioral intentions and actual inclusive practices in the classroom includes online or hybrid approaches to in-service teacher training (Baldiris Navarro et al., 2016; Courey et al., 2013; McGhie-Richmond & Sung, 2013), stand-alone in-person teacher training (Elder et al., 2016; Hundert, 2007; Katz, 2015), and

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performance feedback (Akalin & Sucuoğlu, 2015; Brown et al., 2014; Duchaine et al., 2011).

Empirical studies across these approaches show measurable improvements in teachers' intentions (as demonstrated in their design of inclusive instructional lesson plans; Baldiris Navarro et al., 2016; Courey et al., 2013), and more notably, in teachers' adoption of targeted inclusive instructional practices (Akalin & Sucuoğlu, 2015; Brown et al., 2014; Duchaine et al., 2011; Elder et al., 2016; Hundert, 2007; Katz, 2015).

Among these approaches, stand-alone in-person teacher training enjoys a more robust evidence base, including demonstrated efficacy in contexts similar to Ethiopia (Elder et al., 2016). On the other hand, the evidence base on this approach is mixed concerning the scope and strength of the effect on teacher adoption of inclusive practices (Hundert, 2007; Sucuoğlu et al., 2015), particularly in the absence of rigorous comparable studies with strong samples. Nevertheless, the referenced studies suggest that in-service teacher training can be effective in promoting teacher adoption of some inclusive instructional practices if delivered with at least 2.25 hours of total training time in more than one session and in a timeframe of at least two weeks (Hundert, 2007).

Notably, this body of literature points to the efficacy of UDL as a conceptual framework to underpin intervention content and design across approaches (Baldiris Navarro et al., 2016; Courey et al., 2013; Elder et al., 2016; Katz, 2015). UDL approaches not only promoted teacher adoption of inclusive instructional practices but also affected student-level outcomes (Akalin & Sucuoğlu, 2015). Furthermore, as Elder et al. (2016) suggested, leveraging UDL as a framework for curriculum accommodation may benefit all students in inclusive classrooms, not just students with special needs. Effective interventions among the referenced studies also suggest an important role for comprehensive manuals, lesson planning templates, and multiple content

formats to strengthen teacher training efforts. Performance feedback, although limited in research to higher-income contexts to date, similarly yielded promising results on teachers' adoption of targeted inclusive behaviors (Akalin & Sucuoğlu, 2015; Brown et al., 2014; Duchaine et al., 2011).

Literature Synthesis Summary and Intervention Design Parameters

In summary, the existing empirical evidence indicates a wide range of approaches to addressing the multiple aspects driving teachers' instructional behaviors in inclusive education at the classroom level. From the lens of ecological systems theory, the referenced interventions are situated at the mesosystem (school) level, out of the various systems affecting the developing child. This level of proximity is just one removed from the child's family (microsystem), marking an environment likely to influence the child's development. The body of knowledge synthesized in this chapter paints a rich picture of inclusive education interventions in a diversity of contexts. The theory of planned behavior served as a blueprint for this literature synthesis. Across the dimensions of the theory of planned behavior, notably teacher attitudes, subjective norms, self-efficacy, and teachers' behavioral intentions and adoption of inclusive classroom practices, intervention approaches in the literature include

- co-teaching;
- stand-alone in-person teacher professional development;
- school collaboration initiatives;
- school-wide efforts;
- collaborative consultation;
- online/hybrid teacher training; and
- in-person training with performance feedback.

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From a methodological lens, the existing body of knowledge is marked by predominantly small convenience samples and pretest-posttest mixed methods study designs. Studies used a range of existing and newly developed instruments for data collection, and data collection methods varied depending on the focal construct. Given the diversity of focal domains, instrumentation, and contexts, meta-analytical comparisons of intervention effects are not feasible. Nevertheless, this body of evidence points to stand-alone in-person in-service teacher training as a viable approach to addressing not only one, but several theory of planned behavior domains, including teacher attitudes toward inclusion, teacher self-efficacy for inclusive instruction, teachers' behavioral intentions, and teachers' adoption of inclusive classroom practices.

Considering the aim of the overall assistive technology initiative to improve the quality of inclusive education in Ethiopian classrooms, and most notably teachers' adoption of inclusive instructional practices, in-person in-service teacher training as an intervention approach appears to be justified based on this literature. Given the resource constraints in Ethiopia, it is promising that measurable gains in teacher attitude, self-efficacy, and some instructional practices can be achieved in similar contexts with as little as three to four days of total training time and over as little as two to three months of implementation. However, to optimally support teachers, the referenced evidence base suggests in-person training should be spaced and delivered over several weeks. Furthermore, training follow-up, and potentially integrating elements of performance feedback, may further strengthen the intervention. To sustain interventions and promote a more inclusive school climate addressing potential barriers with perceived subjective norms on inclusion, the engagement of principals should be a cornerstone of intervention design.

In terms of content and delivery format, researchers should consider UDL as a guiding framework in such training and promote multiple ways of presentation, action, and expression.

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Consequently, carefully designed supportive documentation and explicit lesson accommodation guidance leveraging multiple formats, including manuals, slides, audio, or video elements, should be considered. Finally, teacher training delivery formats should also provide multiple means of action and engagement by including a combination of information sharing activities, group discussions, video study, structured reflection, and hands-on practice.

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Chapter 4: Intervention Procedure and Program Evaluation Methodology

The empirical foundations for improving inclusive education presented in the previous chapter underpinned the design of the assistive technology initiative in Ethiopia. The purpose of the intervention was to address classroom-level barriers to quality inclusive education for children with disabilities. As such, the focus of the intervention was on a subset of factors encompassed within the ecological systems theory that contribute to their low school enrollment. Embracing the theory of planned behavior as a conceptual framework to help explain teacher-student interactions within that mesosystem level of child development, the aim of the intervention was to improve teacher adoption of inclusive instructional practices in regular reading classrooms. Similarly, the measures collected align with the key dimensions of that theory with one exception: Although related data were collected, this dissertation study does not extensively discuss issues on subjective norms from a school leader perspective. Instead, other study team members analyzed and reported on these data (W. Macon, personal communication, November 1, 2016).

Consistent with the evidence base from the literature synthesis presented in Chapter 3, the main intervention components included in-service teacher professional development, provision of multimedia instructional materials (lesson plans) with explicit accommodations for children with visual or hearing impairments, and classroom monitoring visits. Later sections of this dissertation provide a detailed explanation of these intervention components. The specific intervention research questions were:

- How do teachers use the accommodated instructional materials to support adoption of inclusive instructional practices?
- To what degree does participation in the intervention improve teachers' attitude toward inclusive education and their self-efficacy for teaching students with sensory disabilities?

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- To what degree does participation in the intervention improve teachers' adoption of inclusive instructional practices in regular reading classrooms?

Figure 12 visualizes the overall study timeline and key events across research design and implementation activities. The figure highlights the major research components (larger circles) over the various preparatory intervention development activities (smaller circles).

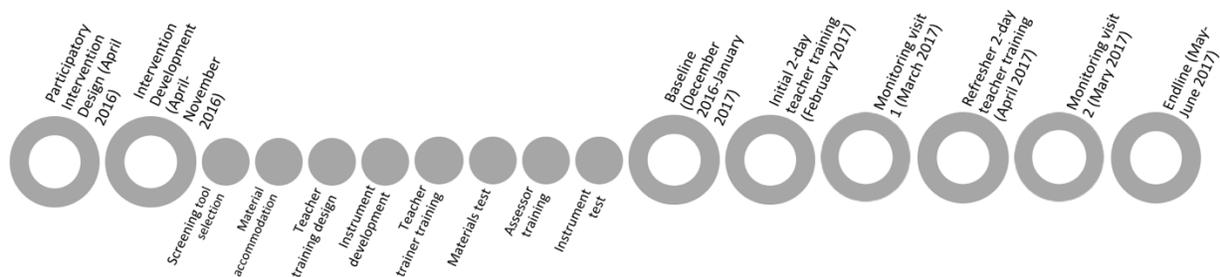


Figure 12. Research and intervention design and implementation timeline.

The next sections outline the overall research design and logic model of the assistive technology initiative. The intervention logic model highlights the anticipated process among research inputs, intervention components, and outcomes. It also includes measurement approaches to focal variables.

Intervention Research Design

The assistive technology initiative team adopted a pragmatic philosophical stance (Creswell & Plano Clark, 2011) as an overarching paradigm to guide the research design. This stance supports a focus on what works to practically address the problem of inclusive education quality at the classroom level in Ethiopia. In alignment with this paradigm, a convergent mixed methods design provided the basis for evaluation of the efficacy of the intervention. A convergent design allows for a complementary integration of quantitative and qualitative data (Creswell & Plano Clark, 2011) and, in this case, helps develop a more comprehensive picture of participating teachers' attitudes, beliefs, and behaviors. The study team applied the data-

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validation variant of the convergent mixed methods design. This approach employs qualitative data to help explain quantitative findings from the teacher interviews and classroom observations (Creswell & Plano Clark, 2011). The study featured a pretest-posttest design with one data collection in advance of the intervention (the baseline, which was largely reported on in Chapter 2 of this dissertation) and a final data collection following three months of implementation (the endline).

Figure 13 visualizes the theory of change underpinning the study and provides insight into both the process and outcome evaluation of the intervention. A comprehensive logic model, outlining inputs, activities, outcomes, and impact, as well as intervention assumptions and potential external factors influencing the study, appears in Appendix E.

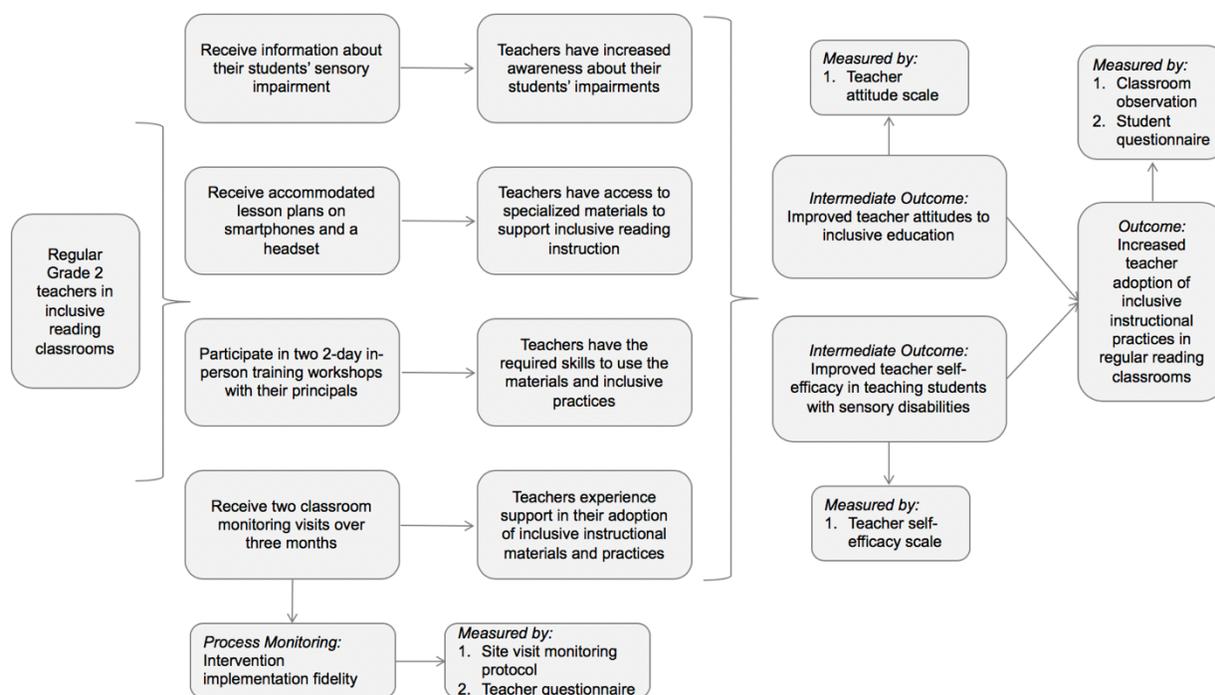


Figure 13. Theory of change for increasing teacher adoption of inclusive instructional practices.

As shown in the theory of change in Figure 13, the study team assumed teachers' participation in the intervention (independent variable) would improve their attitude toward inclusive education (mediating short-term outcome variable). Likewise, the study team assumed

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that participation in the intervention would also improve teachers' self-efficacy for teaching students with sensory disabilities (mediating short-term outcome variable). Finally, the study team assumed that improvements in teachers' attitude and self-efficacy would lead to teachers' increased adoption of inclusive instructional practices in regular reading classrooms (dependent variable). The latter served as the focal outcome variable for this dissertation research.

As detailed in Chapter 3, an existing body of evidence and the theory of planned behavior (Ajzen, 1991) as a conceptual framework support the main parameters of this theory of change, markedly the anticipated relationship between participation in the intervention and teacher attitude, self-efficacy, and adoption of inclusive practices. In addition, classroom monitoring visits served two purposes for the study. First, classroom visits presented an intervention component aimed at supporting participating teachers in the adoption of inclusive instructional materials and practices. Second, classroom monitoring visits presented an opportunity for process and intervention implementation fidelity monitoring. In consideration of the dissertation research questions and the adopted theory of change, the next sections outline the research methods adopted for the study. The sections describe study participants and data collection measures, as well as intervention and data collection procedures, including those related to the classroom monitoring visits, which are discussed in the applicable intervention section.

Endline Data Collection Methodology

Endline Participant Selection and Final Study Sample

The selection of participating teachers and classrooms is described in detail in Chapter 2 of this dissertation. As outlined there, the selection process followed a multi-stage convenience sampling procedure in consultation with MOE staff. The aim of the assistive technology initiative was to reach at least 55 schools and 110 classrooms in the five regions: 10 schools each in Amhara, Ethio-Somali, Oromiya, and Tigray; and 15 schools in SNNPR. Schools needed to be

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reachable within a half day drive of the regional capital. Figure 14 shows a map of Ethiopia noting the country's regions.

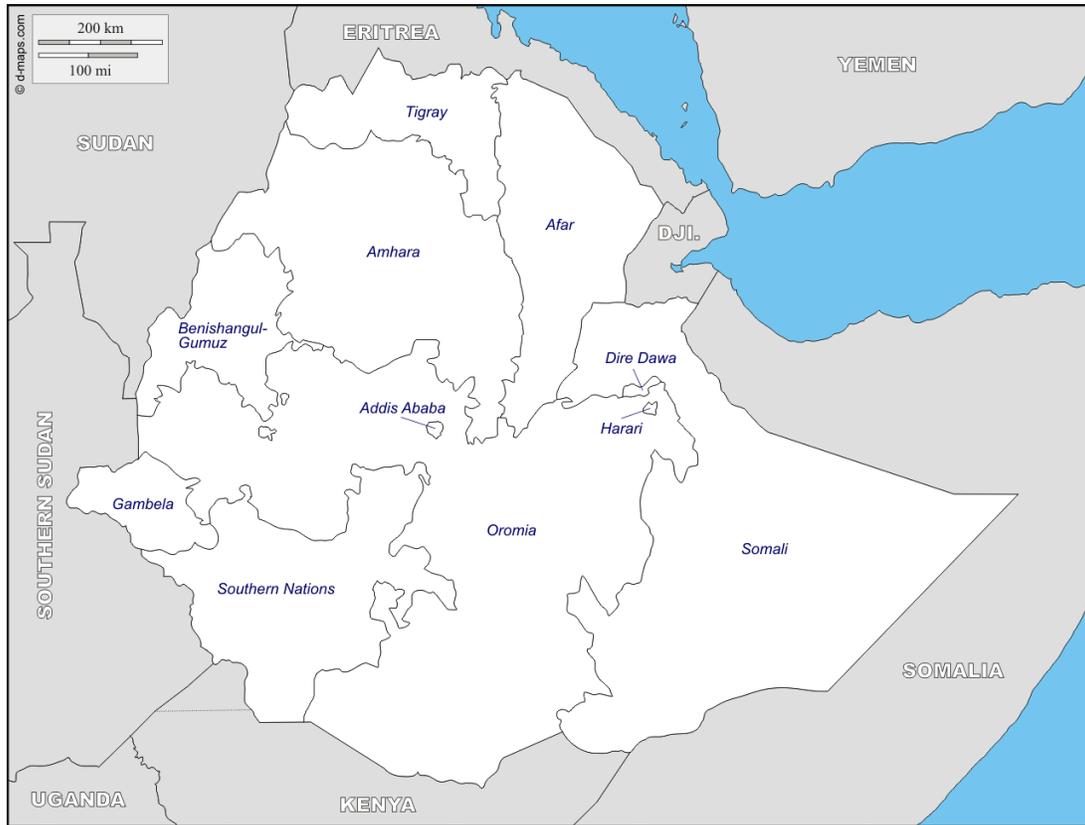


Figure 14. Map of Ethiopia showing regions. D-maps (n. d.) [Map of Ethiopia with regions].

Retrieved February 6, 2018, from http://d-maps.com/carte.php?num_car=4258&lang=en

Participating schools had to have at least two Grade 2 classrooms. Among eligible schools, the selection was random. In each school, two classrooms were selected for participation in the intervention. Selected classrooms had to have at least three children with a hearing impairment or vision impairment following the study's baseline screenings. Classroom teachers had to have received training on the revised reading curriculum in the mother tongue and accompanying textbooks. Among eligible classrooms, the selection was random. Participating teachers were the class teacher from each selected classroom. A total of 110 teachers from at least 55 schools were to participate in the study.

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As outlined in Chapter 2, the final sample for the baseline included 109 teachers from 63 schools in five regions. The larger number of schools than projected was a result of some classrooms' ineligibility for participation. For the most part, classrooms were ineligible because classroom teachers had not yet been trained on the new mother tongue reading curriculum previously developed by READ TA or had not yet received the new textbooks. In that case, replacement classrooms were sought in other schools in regional proximity to the originally selected school.

At endline, the same 63 schools were visited, and a total of 101 teachers were interviewed. Eight teachers who participated at the time of baseline data collection were not available at the time of endline data collection. In addition, 624 students in these 101 classrooms participated in the endline interviews. Of these students, 328 were among those identified as possibly having a potential vision and/or hearing impairment at baseline. Seventy students identified with a potential vision and/or hearing impairment were not available at endline. The 296 students without a hearing or vision impairment participating in the endline data collection were selected randomly from the same classroom as the students with a potential sensory impairment. Therefore, the sample of students without a vision or hearing impairment was different in the baseline and endline data collection. Data collectors also conducted 325 classroom observations at endline and interviewed 58 principals.

Endline Measures

As outlined earlier, the endline research questions focused on (1) how teachers used the accommodated instructional materials to support adoption of inclusive instructional practices, (2) to what degree participation in the intervention improved teachers' attitude toward inclusive education and their self-efficacy for teaching students with sensory disabilities, and (3) to what degree participation in the intervention improved teachers' adoption of inclusive instructional

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practices in regular reading classrooms. In consideration of these research questions, endline data collectors applied four of the six instruments used during the baseline data collection: (a) teacher interview questionnaire, (b) classroom observation tool, (c) student interview instrument, and (d) principal interview questionnaire. A summary matrix visualizing the alignment among research questions, operationalization of focal variables, data collection measures, and data analysis can be found in Appendix F.

Measuring teacher usage of accommodated instructional materials. To measure how teachers used the accommodated instructional materials to support adoption of inclusive instructional practices, the study team added new questions to the teacher interview questionnaire and classroom observation tool from the baseline data collection. A four-person team of RTI staff, including members of the original instrument development team with education and Ethiopia expertise, as well as the two Ethiopia-based evaluation and special needs education experts, developed the new items. The new teacher interview questionnaire items queried how comfortable teachers had become with the smartphone for screening and using the inclusive multimedia lesson plans. The closed-question items requested teachers to choose an option from *very comfortable*, *somewhat comfortable*, and *not very comfortable* and queried teachers on how these tools and the related training could be enhanced. A new open question also asked for teachers' suggestions for improving the intervention in general.

New items for the classroom observation tool included asking whether the teacher was using an inclusive multimedia lesson plan during the observed lesson and, if yes, how confident the teacher appeared in its use. New items also queried whether the teacher played back any of the embedded audio files during the lesson and, if yes, how confident the teacher appeared in doing so. Classroom observers rated teachers' level of confidence as *very confident*, *somewhat confident*, or *not at all confident*. Added items also asked whether the teacher gave the

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smartphone directly to students to listen to audio or access text. Finally, a new item queried if and to what degree the use of the smartphone and multimedia lesson plans distracted the other students. This new item required classroom observers to choose an option from *distracting students a lot, distracting students a little, and not distracting the other students*.

Measuring changes in teacher attitude and self-efficacy. To measure participating teachers' attitude toward inclusive education and their self-efficacy for teaching children with vision or hearing impairments after the intervention, the endline data collection included the final attitude and self-efficacy scale developed from the baseline data collection. The scale for teacher attitude toward inclusive education scale contained the 10 final items from the factor analysis described in Chapter 2. To demonstrate internal reliability of the scores, the study team again used Cronbach's alpha, which yielded a reliability coefficient of 0.71 for the attitude scale at endline.

To measure teacher self-efficacy for teaching children with sensory disabilities, the endline data collection included the same six-item scale developed at baseline. To demonstrate internal reliability of the scores, the study team used Cronbach's alpha, which yielded a reliability coefficient of 0.73 for the self-efficacy scale at endline.

Measuring teachers' adoption of inclusive instructional practices in regular reading classrooms. To measure teachers' adoption of inclusive instructional practices in regular reading classrooms, the endline data collection included the same classroom observation tool and student interview questionnaire from the baseline data collection. No new items were added or other changes made to these instruments for addressing this specific research question at endline.

Study Intervention Procedure

As visualized in Figure 13 earlier in this chapter, and in the outputs section of the logic model in Appendix E, the main intervention components to improving teacher adoption of

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inclusive instructional practices in Ethiopia consisted of (1) screening students for sensory impairments and informing teachers of the results, (2) providing teachers with multimedia instructional materials (lesson plans) with explicit accommodations for children with visual or hearing impairments, (3) teacher professional development, and (4) classroom monitoring visits. The next sections describe each intervention component in detail.

Screening Students for Potential Vision or Hearing Impairment

As outlined in Chapter 2, the data collection teams screened all students in participating classrooms for a potential vision or hearing impairment at baseline. To screen students, the study team used the clinically validated smartphone-based app HearScreen for hearing screening and PeekVision for vision screening. Data collectors then shared the screening results with participating teachers after the baseline data collection to inform them of their students' potential impairment.

Accommodating Instructional Materials

The study team revised three months of the scripted daily reading lesson plans in the national Grade 2 teacher guide to include explicit, evidence-based (Bulat, Hayes, Macon, Tichá, & Abery, 2017) accommodations for children with a vision or hearing impairment. To help standardize accommodations across the seven focal languages of the intervention, the study team developed an accommodation guide. Furthermore, the study team organized the accommodation development activity as a joint workshop across all language teams, including introduction and training for all teams together. Accommodations were developed by teams of special need experts and mother tongue reading and curriculum experts in Ethiopia. Example accommodations included asking teachers to provide oral explanations of images in the student book, restructuring activities to include peer support, or instructing teachers to give extra time to the students with a vision or hearing impairment.

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The study team also recorded and integrated audio files for all phonemic awareness and story elements into the accommodated lesson plans in consideration of UDL principles (i.e., accommodating curricula to provide multiple ways of presentation, action and expression; CAST, 2011). The study team used a tool developed by RTI under the leadership of the dissertation author to render all lesson plans in a smartphone-based app. This inclusive multimedia lesson plan app (Figure 15) allowed teachers to access the lesson plans on the smartphone and filter by week and day of the school year for the desired lesson.

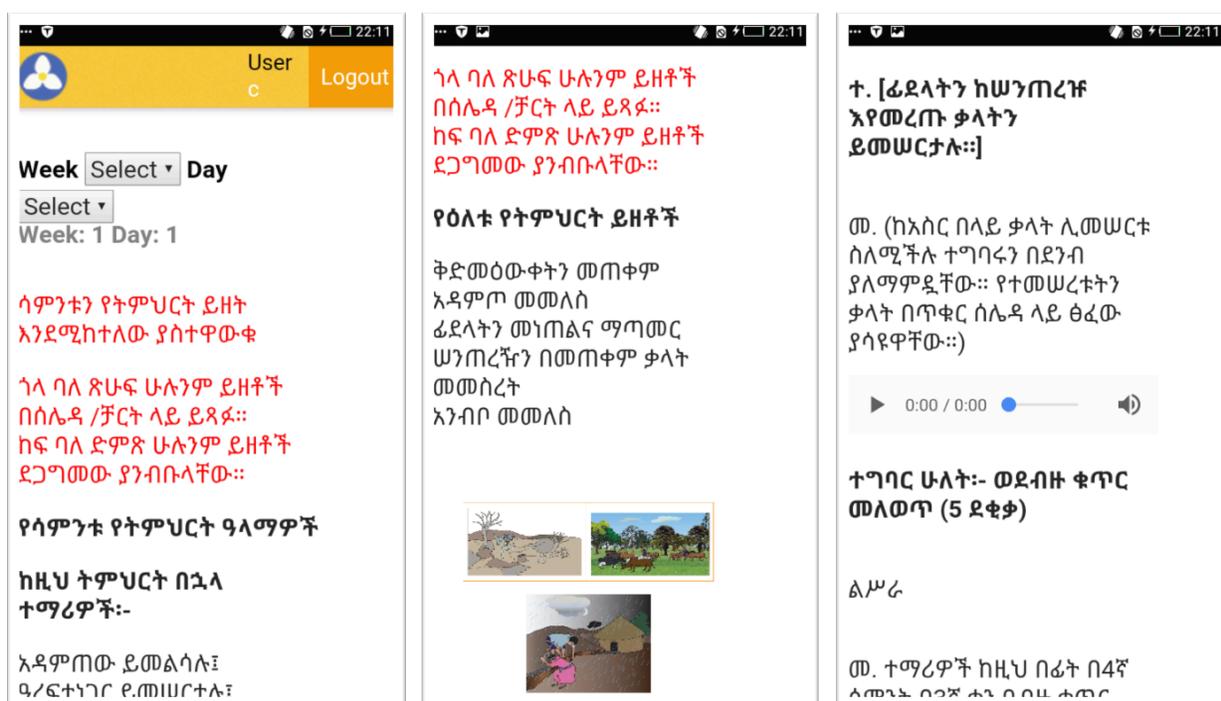


Figure 15. Example screenshots from the multimedia lesson plan app in Amharic.

Following the development of the accommodated instructional materials, the study team organized a review workshop to assure the quality of the work across the seven languages. These review workshops included members of the regional education bureaus and MOE. Furthermore, the study team organized a two-week materials test in advance of the intervention and trained 12 teachers in six schools not selected for participation in the intervention to use the inclusive multimedia lesson plans on smartphone devices. The teachers provided feedback on ease of use

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of the app and usability of the lesson plans and smartphone in the classroom teaching context.

This test resulted in enhancements in the filtering system for the lessons, as well as font size and color schemes. The study team neither collected any additional data from these schools nor implemented any further activities in these classrooms.

Teacher Professional Development

Teachers participated in four days of in-person teacher training held in groups (by region) at five participating schools. In line with the existing research on effective teacher development as presented in Chapter 3 (e.g., Kurniawati et al., 2017; Sucuoğlu et al., 2015), the training was spaced and delivered as a two-day workshop following the baseline data collection in February 2017 and a two-day training after the first month of implementation in April 2017. The training refreshed teachers' knowledge of the new reading curriculum, clarified relevant inclusive education concepts, and introduced the smartphone-based inclusive multimedia lesson plans. Further drawing on the literature (e.g., Hundert, 2007; Sucuoğlu et al., 2015), the training prioritized hands-on practice of instructional strategies using the inclusive multimedia lesson plans.

The study team developed a teacher training manual and an inclusive multimedia lesson plan app user guide to ensure consistency of the training delivered across languages, venues, and sessions. To further ensure consistency and quality in the cascading training model, the study team organized three days of joint training for the trainers delivering the teacher training in each language. The teacher training manual covered session details for three days of training, leaving the fourth and final day of the training flexible for trainers to adjust to their specific group of teachers' needs. The study team adapted the teacher training manual to each of the seven focal languages. As for the inclusive multimedia lesson plans, a set of external reviewers assured the

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quality of the training manual in each language. The English version of the teacher training manual appears in Appendix G.

The initial two-day training included not only the 109 participating teachers but also their school principals. The study team included principals in the teacher training in consideration of relevant literature on the importance of institutional support for inclusive education as described in Chapter 3 (e.g., Deppeler, 2006; Richards et al., 2014; Yeung, 2012). All 63 principals of the participating schools attended the training. Following the initial training, each participating teacher received a smartphone and headset and was asked to use the inclusive multimedia lesson plans for the next three months in their mother tongue reading classrooms.

Classroom Monitoring Visits

The study team conducted one monitoring visit to each classroom within the first month of the intervention and one visit following the second training in the second month of the intervention. Each visit took approximately 1.5 hours. During their visit, the study team observed a reading lesson and provided pedagogical feedback and support in the use of the inclusive multimedia lesson plans to the teacher.

To strengthen implementation fidelity of the classroom observations and to standardize process evaluation data collection, the study team developed a structured classroom monitoring visit protocol. The protocol captured items such as whether the teacher was using the smartphone and inclusive multimedia lesson plans during the observed lesson, how confident the teacher appeared, and whether and how the teacher was using the embedded-audio files. The Ethiopia-based research team developed the classroom monitoring protocol in English for review by two of the international instrument development team members mentioned in Chapter 2 of this dissertation. The monitoring protocol was administered electronically on Tangerine, RTI's open source data collection platform.

Endline Data Collection Procedure

At endline, the study team applied a similar data collection procedure to the one applied at baseline. Specifically, the study team again engaged a total of 33 assessors in 11 data collection teams. Assessors, nearly all of whom already served as data collectors during the baseline collection, were again recruited across the five regions and seven language communities. The study team held a two-day data collection refresher training on May 18–19, 2017, and endline data collection took place from May 22 to June 2, 2017. The endline data collection was shorter than the baseline data collection because it did not include student screening for vision or hearing impairment.

To ensure the consistency and quality of the data collection across assessor teams, the study team updated the baseline assessment protocol for the endline. As per this protocol, upon arrival and greeting with the principal at the school, endline data collection teams first ensured again consent from participants. Assessors then proceeded to conduct a classroom observation for each participating teacher. Following the classroom observations, data collection teams conducted the student, teacher, and principal interviews. The endline assessment protocol appears in Appendix H.

Endline Data Analysis and Exploring Replication

As discussed in Chapter 2 of this dissertation, the overall study adopted a convergent mixed methods design that was aligned with the pragmatic stance of informing what works in improving inclusive instruction in Ethiopian classrooms and that addressed a subset of the factors driving the problem of low school enrollment of children with disabilities. A core element of this dissertation is to explore replicability of the intervention in Ethiopia and elsewhere in complement to establishing whether the study achieved anticipated outcomes. In this view, the

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dissertation author adopted a two-pronged approach to the endline data analysis and reporting of findings.

First, the dissertation author conducted endline data analysis with the aim to answer the study's overall research questions on (1) how teachers used the accommodated instructional materials to support inclusive instruction; (2) to what degree participation in the intervention improved teachers' attitude toward inclusion and self-efficacy for inclusive instruction; and (3) to what degree the intervention improved teachers' adoption of inclusive instructional practices.

Second, the dissertation author drew on post implementation review and evaluability assessment approaches to present the research findings and to interrogate study design, implementation, and results from the perspective of replicability in low- and middle-income country contexts.

Endline Data Analysis

The study team utilized similar descriptive data analysis approaches and techniques to those utilized for the baseline data analysis. All data were uploaded in encrypted form from the data collection tablet devices to the Tangerine server and then downloaded as comma-separated values files for analysis. Data were again analyzed by an RTI statistician together with the dissertation author; all data were cleaned, and then datasets were merged as appropriate for analysis. The statistician and dissertation author used Stata data analysis and statistical software for all data analysis. As outlined in the summary matrix in Appendix F, data analysis techniques for the quantitative data included establishing frequencies for relevant items and calculating means for the teacher attitude and teacher self-efficacy scales. The endline data analysis also included the comparison of group means between baseline and endline, as well as tests for statistical significance of mean differences. The study involved applying multiple regressions to

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establish possible predictors of positive attitudes or self-efficacy among participating teachers at baseline.

The dissertation author conducted the data analysis for the qualitative data, notably the responses to open questions in the teacher questionnaire, and used an inductive approach (Southampton Education School, 2012) to coding teacher responses to open questions. This approach allowed themes to emerge from the data, unlike pre-coded topics that may favor existing preconceptions (Turner, Busby, & Carpenter, 2011). The dissertation author conducted the qualitative analysis in a multi-stage approach as recommended by Creswell and Plano Clark (2011). Due to the limited number of participants and open questions, the analysis was conducted in MS Excel with using the comma-separated values file of the combined teacher responses across languages downloaded from the Tangerine server.

In a first stage, the dissertation author reviewed the first teacher's responses and developed codes to encapsulate thoughts expressed in multiple words or sentences. The dissertation author then read all other teachers' responses while looking for responses fitting the same, similar, or different codes. New codes emerged at that stage. In a next step, the dissertation author re-read all responses again to ensure no topics or issues had been missed and refined codes as needed. Finally, the dissertation author established the frequency with which each code was mentioned across participating teachers to establish dominant themes from the responses.

Exploring Replication

This dissertation study provides critical insights into the prevalence of vision and hearing impairment in the participating regular classrooms in Ethiopia and the efficacy of one possible intervention in affecting teacher behavior change in inclusive education. With these insights, the study not only fills a critical gap in the evidence base from Ethiopia but also contributes to mitigating the globally prevalent lack of relevant data in this domain, as discussed in Chapter 1.

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Consistent with the study's adoption of a pragmatic worldview for this research, a key task remains. Given the low-income context in Ethiopia and countries facing similar challenges to quality inclusive education and enrollment of students with disabilities, an exclusive focus on outcomes alone is shortsighted. The efficacy of the intervention lies in not only its ability to demonstrate measurable, or even statistically significant, improvements in teachers' adoption of inclusive instructional practices in the participating regular reading classrooms but also its potential for replication in Ethiopia and beyond.

From the perspective of replicability, the endline data analysis and presentation of findings then become part of the process of the overall dissertation research rather than its end state. This expanded view extends the narrower publication of study findings by the dissertation author on behalf of RTI (RTI, 2017a), thus making a unique contribution to the field. The study draws on two approaches, post-implementation review and evaluability assessment, to interrogate the design, implementation, and findings of the intervention from the perspective of replicability in low- and middle-income country contexts.

Post-implementation review. Several donor organizations use some form of post-implementation or completion review to evaluate the efficacy of their funded programs (Asian Development Bank [ADB], 2014; United Kingdom Department for International Development [DFID], 2011). In these reviews, donors commonly explore criteria, including the program's success in consideration of its results framework and performance indicators (outputs, outcomes, and impact), the value for money or economic performance of the program in achieving its objectives, and sustainability beyond the duration of a donor-funded project (ADB, 2014; DFID, 2011). Additional review criteria might include aspects of equity, risk, and lessons learned (DFID, 2011), as well as aspects of environmental, social, health, and safety performance (ADB,

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2014). This study adopted the three shared criteria between the ADB and DFID post-review approaches: program success, program cost, and sustainability.

Concerning the program success criterion of post-implementation review approaches, Chapter 5 presents the findings of the study aligned with the outputs and outcomes in the intervention's logic model (Appendix E). Considering program cost, Chapter 5 discusses economic performance and cost considerations of the intervention and its replication. As for sustainability, Chapter 5 discusses the potential of sustainability of the intervention beyond a donor-funded project life cycle.

Evaluability assessment. Evaluability assessment provides key considerations relevant to maximizing utilization of study results for improving program interventions (Leviton, Khan, Rog, Dawkins, & Cotton, 2010). Evaluability assessment is usually applied to inform the viability and cost-effectiveness of a larger-scale program evaluation. For this dissertation, however, the approach is conceptualized as a post hoc reflection with a focus on the viability of replication. Strosberg and Wholey (1983) put forward three conditions to help interrogate and establish whether an evaluation is likely to lead to findings that can help trigger related stakeholder action to improve the intervention.

The first condition establishes whether there is clarity of focus regarding inputs, activities, outputs, and outcomes of the intervention (Strosberg & Wholey, 1983). In this view, Chapter 5 discusses the degree to which the present intervention aligned with program inputs on the one hand and anticipated outcomes on the other hand in consideration of the logic model in Appendix E. The second condition explores whether program objectives are plausible (Strosberg & Wholey, 1983). As discussed in earlier chapters, rigorous evidence and causal models that provide a foundation for establishing the plausibility of an inclusive education intervention are limited in low- and middle-income countries (Wapling, 2016). Similarly, large-scale inclusive

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education interventions have not yet been researched in these contexts (Wapling, 2016). Chapter 5 discusses the degree to which there is evidence, also beyond the results from the process and outcome evaluation of the present study in Ethiopia, that suggests the plausibility of project objectives and achievement of outcomes for a potential replication.

The third condition proposed by Strosberg and Wholey (1983) is the degree to which the intended use of the information gained from the evaluation is well defined and can help bridge the gap between research and practice. Chapter 5 discusses this criterion from a reflective perspective and describes relevant lessons learned from the initiative in Ethiopia. Illustratively, this discussion highlights information needs and how they differ among key stakeholders of the Ethiopia intervention and what that might mean for its replication in future contexts.

Chapter 5: Replicating Improvements in Inclusive Instruction

For this dissertation, *replicability* is defined as “the potential of a project, innovation or pilot test to be replicated, scaled up, expanded, or adapted” at another location or time (Food and Agriculture Organization of the United Nations (2014, p. 7). The emphasis on adaptability of the original intervention distinguishes this definition from others, which emphasize exact duplication, such as that of Sigrist et al. (2016): replicability “denotes the property of a system that allows it to be duplicated at another location or time” (p. 2). The definition used in this dissertation differs also from others that employ more scientific and statistical terms, for example, the “ability of a researcher to duplicate the results of a prior study using the same materials and procedures as were used by the original investigator” (Subcommittee on Replicability in Science, 2015) or “re-performing the experiment and collecting new data” (Patil, Peng, & Leek, 2016).

Assessing replicability of an intervention might take place during an intervention or after the original intervention concluded. To explore replicability during or after the completion of an intervention, the dissertation author has examined, adapted, and then elaborated on a combination of criteria stemming from the literature on post-implementation review (ADB, 2014; DFID, 2011) and evaluability assessment (Leviton et al., 2010; Strosberg & Wholey, 1983). From evaluability assessment, the dissertation author took the criteria of clarity of focus, plausibility, and utilizability. From post-implementation review, the dissertation author adopted the criteria of overall program success, program cost, and sustainability. Figure 16 visualizes the relevant criteria in their alignment with the goal of replicability.

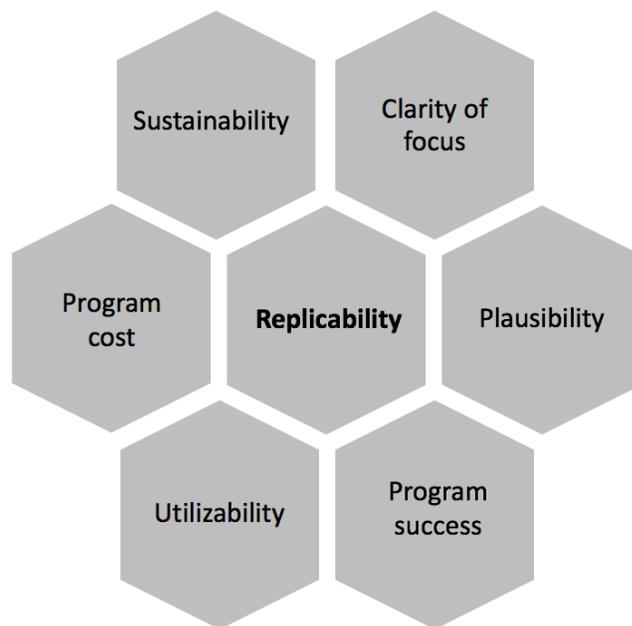


Figure 16. Replicability framework with the proposed six criteria for examination.

The aggregation of these criteria into a comprehensive model to examine replicability of the Ethiopia intervention is an original contribution by the dissertation author. With further validation and research, the resulting framework might also serve other interventions in the future. In the following sections, the dissertation author examines the Ethiopia assistive technology intervention and its potential for replication from the lens of each of these criteria, starting with clarity of focus. In the process, the author identifies and describes replicability-related questions for each of the six criteria.

Clarity of Focus

The concept of clarity of focus comes from evaluability assessment and queries whether program objectives are realistic, well defined, and measurable (Strosberg & Wholey, 1983). This criterion also explores whether inputs, outputs, and assumed change parameters, notably the intervening variables, are explicitly stated (Leviton & Lipsey, 2007). Addressing the clarity of focus criterion within an evaluability assessment typically entails a combination of in-depth document study (especially of original intervention descriptions, monitoring and evaluation

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plans, and progress and technical reports or briefs), implementation site visits, and targeted interviews with stakeholders (Leviton et al., 2010; Strosberg & Wholey, 1983).

Clarity of focus relates to treatment theory. According to Leviton and Lipsey (2007), treatment theory “attempts to describe the process through which an intervention is expected to have effects on a specified target population” (p. 31). Leviton and Lipsey (2007) further describe how intervention research presents a specific segment of social reality, which is simplified and composed of a combination of variables and relationships that researchers operationalize into indicators and procedures for data collection and analysis (such as attitude or self-efficacy scales). In the Ethiopia example, the segment of social reality is the experience of teachers and students in inclusive classrooms, and the variables and relationships refer to the anticipated relationship between teacher attitudes and self-efficacy and how this relationship manifests in teachers’ adoption of inclusive instructional practices.

Thus, beyond the ultimate efficacy of a program, knowledge about the pathways and variables through which the intervention is supposed to achieve impact is equally critical for replicability (Leviton & Lipsey, 2007). With knowledge of these change processes, program designers can identify the most promising components of an intervention, isolate their cost-effectiveness, or extract the most promising predictors of outcomes to design a replication with an increased likelihood for success. Treatment theory further ensures relevance and soundness in research design, operationalization, and interpretation, especially in the absence of an existing body of causal evidence underpinning a study (Leviton & Lipsey, 2007). According to Leviton and Lipsey (2007, p. 58), a treatment theory requires consideration of at least four main elements: (1) problem definition, (2) input description, (3) change parameter specification, and (4) definition of outcomes. An intervention with clarity of focus would integrate a theory of treatment with its theory of change, highlighting the assumed linkages between inputs and

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outputs as well as assumptions about the relationship between intervening variables and focal outcome variables.

The United Kingdom Department for International Development (DFID, 2011) raises another question relevant in examining replicability. As part of its post-implementation review, DFID recommends assessing whether there is “any new evidence available which challenges the project design or rationale” (2011, p. 14). In exploring replicability as a post hoc activity during or following the implementation of a program, this question seems critical and thus should be included in a model for replication.

For this dissertation, *clarity of focus* is defined as the degree to which anticipated relationships of focal constructs and intervening variables are informed by theory and are explicit, current, and coherent. Clarity of focus is considered central to the exploration of replicability; the criterion addresses four main questions as highlighted in Figure 17:

- Is there a conceptual framework underpinning the intervention?
- Are program objectives for replication realistic, well defined, and measurable (Strosberg & Wholey, 1983)?
- Are inputs, outputs, and assumed change parameters, including intervening variables, for replication explicit (adapted from Leviton & Lipsey, 2007)?
- Is there any new evidence available that challenges the project design or rationale for replication (adapted from DFID, 2011)?

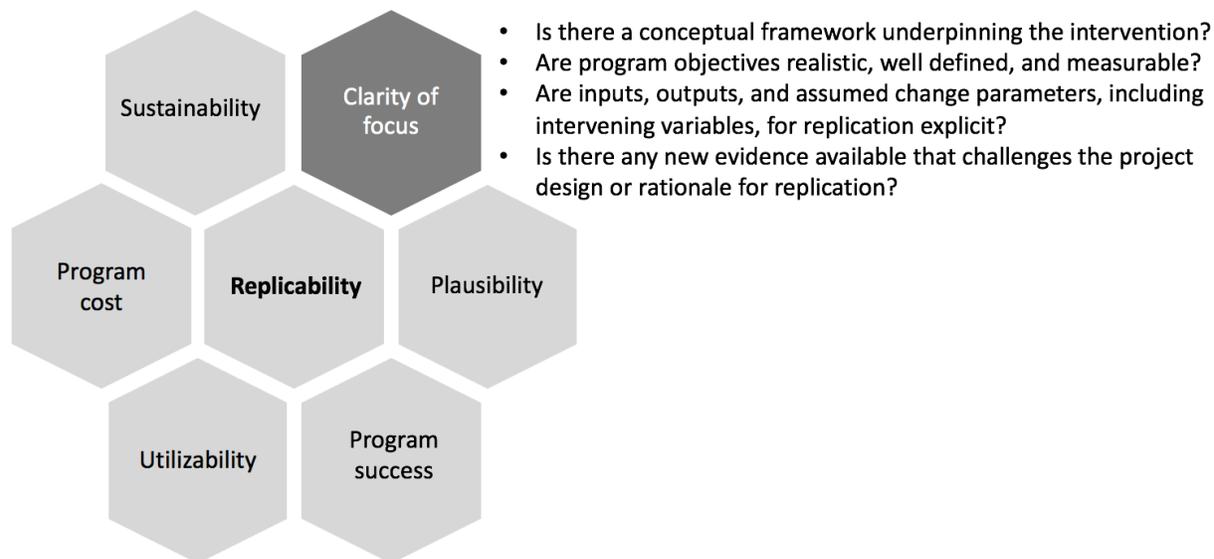


Figure 17. Guiding questions for examining replicability with the lens of clarity of focus.

Conceptual Framework Underpinning the Intervention

This aspect of the criterion of clarity of focus examines whether a conceptual framework is underpinning the intervention research considered for replication. In the case of the Ethiopia intervention, although the ecological systems theory (Bronfenbrenner, 1977; Figure 1) helped structure the literature review on barriers to the school enrollment of children with disabilities (see Chapter 1), the theory of planned behavior (Ajzen, 1991; Figure 7) served as the conceptual foundation for intervention design and evaluation (see Chapter 3). As such, the theory of planned behavior underpinned the study’s theory of change and logic model, as illustrated in Figure 13 and described in Appendix E, respectively. This dual framework was not planned as such at the outset of the intervention because the dissertation author had not yet adopted a conceptual framework during the original design of the intervention and dissertation research, which is why the concept note for the intervention submitted to USAID in October 2016 (RTI, 2016a) does not yet mention a conceptual framework for the study.

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Adopting a conceptual framework early on in the process of designing an intervention, including a replication, offers significant advantages. Conceptual frameworks differ from theoretical frameworks. A theoretical framework “serves as the structure and support for the rationale for the study, the problem statement, the purpose, the significance, and the research questions” (Grant & Osanloo, 2014, p. 12). Theoretical frameworks draw on existing theory and research to help situate the intervention regarding overarching worldview, epistemology, methodology, and existing explanations for the phenomena under examination (Grant & Osanloo, 2014). Theoretical frameworks also offer relevant terminologies, constructs, and definitions (Grant & Osanloo, 2014). Adopting and adhering to a specific theoretical framework in the design and implementation of an intervention not only entails conforming to its established argumentations and interpretations but also provides the opportunity to contribute to an existing body of research explaining the phenomena or relationships under investigation (Leister, 2005).

In contrast, a conceptual framework may be based on an array of existing theories and research but highlights the specific constructs, variables, and assumed relationships driving a particular intervention (Grant & Osanloo, 2014). Conceptual frameworks are “an argument that the concepts chosen for investigation, and any anticipated relationships among them, will be appropriate and useful given the research problem under investigation” (Lester, 2005, p. 460). As such, conceptual frameworks provide program designers the flexibility to integrate existing research across theories while justifying their chosen intervention and research design, including the intervention’s inputs, intervening variables, and anticipated outcomes.

Realistic, Well-Defined, and Measurable Program Objectives

This aspect of the criterion of clarity of focus examines whether the program objectives relevant to replication are realistic, well defined, and measurable. In the case of the assistive technology intervention in Ethiopia, the intervention aimed to improve teacher adoption of

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inclusive instructional practices in regular reading classrooms, thus addressing a subset of the factors leading to the low school enrollment of children with disabilities in low- and middle-income countries (see Chapter 1). This specific objective and outcome target variable, which is reflected in the intervention's theory of change (Figure 13), was, however, initially not the only aim for the initiative. Early program documentation, including RTI's proposal to USAID from 2012 framed the objective as follows (RTI, 2012):

Technology will also be used to facilitate access to learning materials and content for disabled children. We will implement a number of targeted technology initiatives, customized to the needs of each region. . . . We will provide training sessions focusing on essential topics such as strategies for effective needs assessment, capacity building of actors involved, total cost of ownership and institutional sustainability planning, and technology project monitoring and evaluation. . . . Our aim is to build capacity through implementation of a small number of ICT [information and communication technologies]-supported regional initiatives that support learning to read and that address the needs of clearly identified target groups. (p. 27)

As described in the original proposal, an overarching objective for the intervention was capacity building of system actors including staff from regional education bureaus, as well as colleges of teacher education, to evaluate different technologies to determine which are relevant and usable in Ethiopian schools and which offer the best possible educational value at a reasonable cost (RTI, 2012). In the years following the 2012 launch of READ TA, these original plans were refined in response to RTI's better understanding of working with these local stakeholders. Building stakeholder capacity thus changed from an anticipated outcome to be researched to an integral component of the overall implementation approach. As a result, final measurement related to the initiative, as highlighted in the theory of change in Figure 13, was

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limited to the intervention's targeted outcome of increased teacher adoption of inclusive instructional practices in regular reading classrooms. For that outcome, the dissertation intervention was able to operationalize and measure the overall program objective and the anticipated intervening variables included in the intervention's theory of change shown in Figure 13. Given the final results and findings of the intervention (see the section on program success), these program objectives have ostensibly been realistic in the context.

In summary, the example of the Ethiopia assistive technology intervention has shown that replication of the capacity-building objective of the intervention would not be based on realistic, measurable objectives, although, arguably, capacity was built. With no systematic operationalization and measurement, however, this achievement remains anecdotal. Nonetheless, concerning the second program objective of increasing teacher adoption of inclusive instructional practices, the present dissertation study can demonstrate that program objectives were realistic and measurable. As shown in this example, careful analysis of clarity of focus regarding program objectives is central to examining the potential and likely success of replication.

Explicit Alignment of Inputs, Outputs, and Assumed Change Parameters

This aspect of the criterion of clarity of focus examines whether there is an explicit alignment of inputs, outputs, and assumed change parameters for the intervention, relevant to replication. In the case of the Ethiopia intervention, as described earlier, the dissertation author identified the theory of planned behavior as a relevant conceptual framework only in late 2016 while exploring additional intervention literature. This delay led to a gap in the clarity of focus for the Ethiopia assistive technology initiative, highlighted in Figure 18. Notably, although the dissertation research had, from the outset, focused on the constructs of teacher attitudes and teacher self-efficacy as predictors of teachers' adoption of inclusive instructional behaviors in the

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classroom (the intermediate and focal outcome variables of the study are depicted in dark gray boxes in Figure 18), neither the construct of *subjective norms* nor the intervening variable of *teachers' intentions* (depicted in black boxes in Figure 18) central to the theory of planned behavior were explicitly part of the intervention's theory of change or logic model. As such, the assistive technology intervention did not explicitly state and attend to critical aspects of treatment theory.

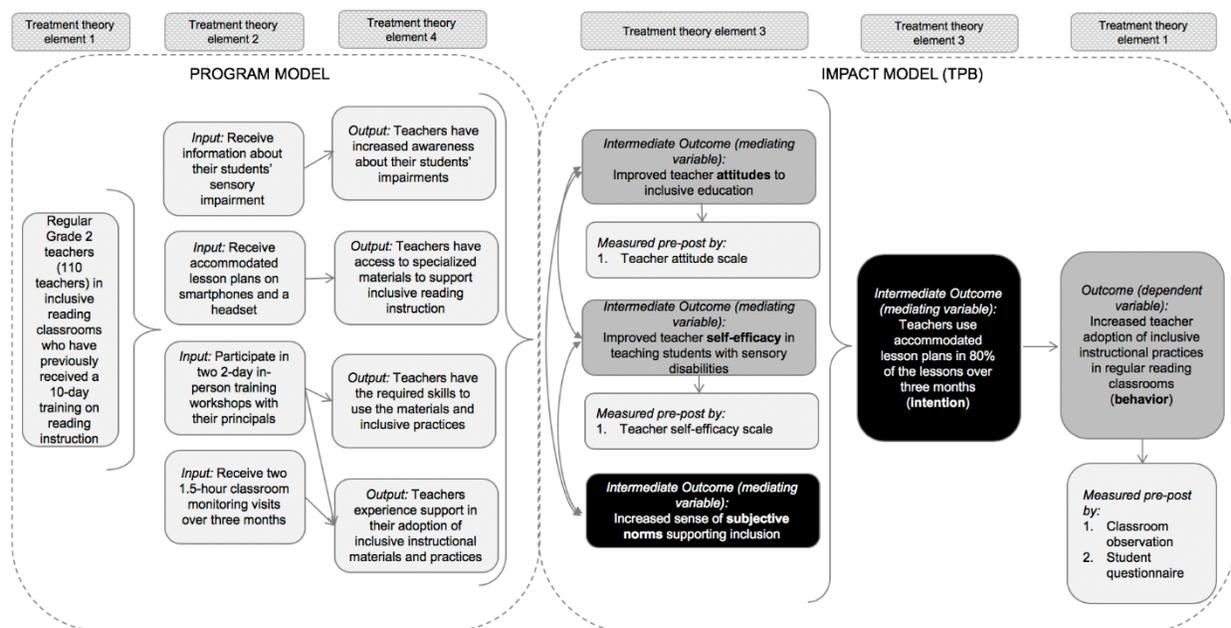


Figure 18. Integrated theory of treatment and theory of planned behavior that (1) illustrates consideration of all four elements of the treatment theory, the intervention's program model, and its impact model and (2) highlights gaps in operationalizing subjective norms and intentions as intervening variables.

While the study did include several questions on school climate and the role of school principals in the teacher interview instrument, it was not fully operationalized as a construct that could be isolated for analysis. Similarly, while the study did include a protocol for the monitoring visits, it did not operationalize teachers' intentions for measurement. The result of

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this gap is the study's inability to conclusively speak to the role of subjective norms as predictors of teacher attitudes or self-efficacy. Similarly, the study is unable to contribute data on the degree to which teachers' intentions to implement the targeted behaviors may be a predictor of their actual adoption of these practices.

New Evidence Challenging the Project Design or Rationale

This aspect of the criterion of clarity of focus examines whether there is new evidence or information that might challenge replication of the project design or rationale. New evidence or information might stem from literature and desk reviews of other studies and project reports, including targeted interviews with stakeholders. In the case of the Ethiopia intervention, such evidence could include research findings challenging the notion of inclusion, new evidence about alternative promising inclusive education efforts, or relevant new research findings on teachers' effective use of technology. Such new evidence or experience pertinent to the Ethiopia intervention did materialize, not from within but from outside the country. RTI had the opportunity to replicate the student screening component of the Ethiopia assistive technology intervention in the Philippines in 2018. The pilot study there raised significant challenges with administering the hearing screening tools used successfully in Ethiopia in the participating Philippine classroom contexts. The latter had, on average, higher levels of ambient noise compared to the Ethiopian schools in the original intervention. This emerging evidence raised the importance of considering school ambient noise levels in examining the viability of this approach to hearing screening for replication efforts.

In summary, clarity of focus, which might be operationalized and documented by adopting an explicit conceptual framework and integrating a theory of treatment with a study's theory of change, is central to successful replication. Without clarity of focus, replication program designers might have gaps in their knowledge about select inputs, outputs, intervening

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variables, or outcomes. These gaps might negatively affect the internal validity of the intervention research (Leviton & Lipsey, 2007), lead to missed opportunities to learn about essential relationships in the focal segment of reality, and potentially lead to replication of extraneous or impact-reducing components. Table 15 summarizes the relevant definitions, guiding questions, and approaches to examining the clarity of focus criterion for replication.

Table 15

Overview of definitions, guiding questions, and approaches to examining clarity of focus

Definition	Guiding Questions	Approaches to Examining Clarity of Focus
Clarity of focus is the degree to which anticipated relationships of focal constructs and intervening variables are informed by theory and are explicit, current, and coherent.	<p>Is there a conceptual framework underpinning the intervention?</p> <p>Are program objectives for replication realistic, well defined, and measurable?</p> <p>Are inputs, outputs, and assumed change parameters, including intervening variables, for replication explicit?</p> <p>Is there any new evidence available that challenges the project design or rationale for replication?</p>	<ul style="list-style-type: none"> • Project document study (original intervention proposal, monitoring and evaluation or project performance plans, progress reports, technical reports, program briefs, etc.) • Implementation site visits • Targeted interviews with stakeholders • Desk and literature reviews • Targeted interviews with stakeholders

Plausibility

Plausibility is a central element of evaluability assessment (Strosberg & Wholey, 1983). Similar to exploring clarity of focus, examining plausibility as part of an evaluability assessment might include a combination of document study, site visits, and stakeholder interviews (Leviton et al., 2010; Strosberg & Wholey, 1983). Plausibility addresses the question of whether program activities are realistic and likely to contribute to the achievement of project objectives (Strosberg & Wholey, 1983). The criterion of plausibility also aims to establish whether the intervention has sufficient resources to be implemented as planned (Leviton et al., 2010). According to Strosberg and Wholey (1983), plausibility analysis “raises questions such as whether to spend money on an

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outcome evaluation if it is already known that important pieces of the program have not been successfully implemented” (p. 68).

At times, successful implementation, however, is also influenced by factors outside of the control of program implementors. ADB (2014) recognizes the role of unforeseen changes in the program environment affecting project performance and evaluates its project monitoring staff on the degree to which they “react promptly and adequately to facilitate success of the project” (p. 26). Anticipating potential risks and external factors affecting the intervention is part of intervention design and implementation and often explicitly included in assessments of program implementation (Saunders, Evans, & Joshi, 2005) or intervention logic models (McLaughlin & Jordan, 1999). Changes in the environment might entail political changes, such as policy changes, teacher strikes, elections, or changes in government that may lead to school closures or other implementation delays. External factors affecting replication might further include changes in security that might prevent relevant participant movement or communication.

Changes in a program’s environment might also stem from confounding events that target participants are engaged in, other actions that lead to results contamination, or the reassignment or attrition of study participants and key personnel implementing the study. Furthermore, changes in the funding environment or critical cost drivers might affect both the availability of resources and the timeline for implementation. External factors might also affect program design, such as when new evidence appears to affect program rationale or when technologies and tools affect the efficacy of the intervention.

For this dissertation, *plausibility* is defined as the degree to which anticipated outcomes are achievable given relevant contextual, financial, and human resource factors and potential changes anticipated. Guiding questions on plausibility for the proposed replication framework include (a) whether outcomes are achievable given timeframe, resources (including financial,

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material, and personnel resources), and human capacity available for replication (adapted from Leviton et al., 2010); and (b) what challenges to replication might arise from changes in the environment (including financial, political, security, research, and innovation-related changes; adapted from ADB, 2014). Figure 19 highlights these guiding questions.

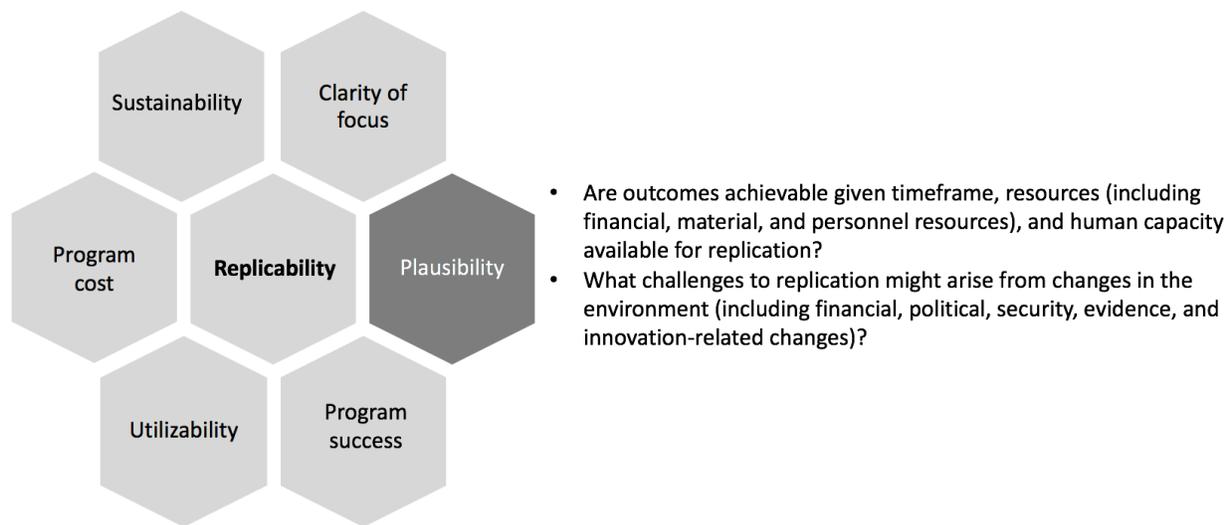


Figure 19. Guiding questions for examining replicability from the lens of plausibility.

Plausible and Realistic Activities and Timeline to Achieve Program Objectives

This aspect of the criterion of plausibility examines whether activities are plausible and realistic to achieve program objectives relevant to replication, especially given potential externally imposed replication timelines. Past research and project experiences in similar contexts can help examine the plausibility of activities to achieve program objectives. In the case of the Ethiopia intervention, Chapter 3 of this dissertation includes a comprehensive discussion on existing interventions that aimed to address some aspects of inclusive education in classrooms in high-, middle-, and low-income countries. Methodologically, this evidence base is still weak, stemming mostly from small convenience samples and quasi-experimental designs. As summarized in Chapter 3, however, there are promising initiatives that have positively affected *teachers' attitudes* toward inclusive education in diverse contexts. These initiatives included co-

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teaching, school-wide efforts, and stand-alone in-service teacher professional development. To date, in-service teacher training appears to have the more robust evidence base, which comes from a diverse set of country contexts. This research suggests that in-service teacher training programs of at least three to four days in length and delivered in various sessions over several weeks can measurably improve teachers' attitude toward inclusive education (Sucuoğlu et al., 2015). Similarly, studied initiatives to date on improving *teacher self-efficacy* for inclusive education entailed collaborative consultation and stand-alone, short-term in-service teacher professional development. The evidence here suggests that stand-alone in-service teacher training may be particularly promising when efforts are at least three to four days in length, even if delivered as a one-time multiday training (Chao et al., 2016; Chao et al., 2017; Forlin & Sin, 2010; Lifshitz et al., 2004).

A small evidence base on initiatives that measurably improve school climate and *subjective norms* on inclusive education is also emerging. This research to date predominantly points to school collaborations with external partners and school-wide approaches to addressing subjective norms. Findings from indicative studies in these domains highlight their longitudinal nature with implementation timeframes of at least two to three years or even longer (Abawi, 2015; Deppeler, 2006; Katz, 2015; Richards et al., 2014; White and Shin, 2016; Yeung, 2012).

Research on teachers' *behavioral intentions* and changes in *inclusive practices* suggest that online or hybrid in-service teacher training with a strong focus on UDL principles can be effective in increasing teachers' behavioral intentions (Baldiris Navarro et al., 2016; Courey et al., 2013; McGhie-Richmond and Sung, 2013), yet the evidence is weak as to the necessary inputs. Similarly, the efficacy of stand-alone in-service teacher training to strengthen teachers' integration and adoption of inclusive practices is mixed, with some training interventions resulting in measurable improvements on the targeted behaviors (Elder et al., 2016) and others

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showing improvements only in a subset of them (Hundert, 2007). In contrast, teacher in-service training with performance feedback appears to be a promising approach. This form of intervention has demonstrated measurable improvements in teachers' adoption of targeted inclusive practices through a mix of initial training sessions of 40 minutes or more and weekly performance feedback sessions for at least one month (Akalin & Sucuoğlu, 2015; Duchaine et al., 2011).

As described in detail in Chapter 4, the Ethiopia assistive technology intervention aimed to improve teacher attitudes toward inclusive education, their self-efficacy, and their adoption of inclusive instructional practices in the classroom. The intervention included two 2-day teacher training events, spaced over one month, as well as monthly classroom observations and teacher reflections with feedback. In light of the existing evidence base, it is plausible that the type, duration, and timeframe of these activities would result in measurable changes in the targeted variables of teacher attitudes, self-efficacy, and practices. Had the initiative included an outcome variable relating to subjective norms, however, the short, three-month timeframe of the intervention might not have been plausible, given the existing evidence base pointing to the need for a longer-term engagement.

Program cost data, knowledge of past successful programs, and a good understanding of the local education system and relevant policies and sector development plans can inform whether activities are realistic. As discussed in more detail in the section on program cost, the teacher and principal training was the main cost driver for the Ethiopia intervention. In the context of Ethiopia, even this seemingly modest set of inputs and investment is significant given a scarcity of resources. However, the country has a theoretical annual allocation of 60 hours of continuing professional development per teacher (Save the Children, 2014). The Ethiopia

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assistive technology intervention activities, with its total of 48 hours of training, might also be realistic from that lens.

Aside from financial or personnel resources, however, the human capacity of relevant stakeholders might also be a key consideration in examining whether activities would realistically affect targeted outcomes in a given context. As such, relying on non-project staff to conduct the teacher training or the monthly school visits as part of a replication of this initiative may require additional efforts in building the necessary capacity in the system. Lastly, the materials needed for the intervention might also affect whether intervention inputs are plausible and realistic to achieve program objectives in the context. While the Ethiopia assistive technology intervention used locally available smartphones, the software and headsets needed for screening children for a potential vision or hearing impairment were procured internationally. The software is a proprietary product carrying an annual license fee. The headsets have to be noise canceling and require professional initial and annual calibration to ensure the integrity of hearing screening results. This calibration is currently done by the software vendor in South Africa and thus presents a limitation for replication both financially and logistically (see also the section on sustainability).

Changes in the Environment

This aspect of the plausibility criterion examines whether there are, or might likely be, changes in the environment relevant to replication. Approaches to sourcing relevant data might include a document study of project progress reports from the original intervention, monitoring a country's news and media, close communication with representatives of the funding agency (where applicable), and conducting targeted interviews with relevant stakeholders. In the case of the assistive technology intervention in Ethiopia, the dissertation author and READ TA project team already anticipated certain potential changes in the environment affecting implementation

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given their existing experience in implementing the larger READ TA program since 2012. The dissertation author included these potential external factors in the logic model developed for the assistive technology intervention in Ethiopia (Appendix E).

External factors that most notably affected the implementation of the assistive technology initiative were related to the political unrest in Ethiopia at the time. The Ethiopian government issued a state of emergency in October 2016 in advance of baseline data collection. The state of emergency lasted through August 2017, well after endline data collection but just in advance of results dissemination activities. This change in environment dramatically limited Internet access to project staff and study participants, affecting communication. The state of emergency also affected project logistics. READ TA needed to limit large group workshops, monitor staff travel routes carefully, and flexibly adjust the location and timing of intervention activities for the safe travel of participants. Overall, while the situation required significant flexibility and adjustment, the experienced project staff, in collaboration with key local actors and with the support of the regional education bureaus, were able to mitigate the impact of this situation on the implementation of the initiative. No other external factors significantly affected the implementation of the Ethiopia assistive technology intervention. Table 16 summarizes the relevant definitions, guiding questions, and approaches to examining the plausibility criterion for future interventions and studies.

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Table 16

Overview of definitions, guiding questions, and approaches to examining plausibility

Definition	Guiding Questions	Approaches to Examining Plausibility
Plausibility is the degree to which anticipated outcomes are achievable given relevant contextual, financial, and human resource factors and potential changes anticipated.	<p>Are anticipated outcomes achievable given timeframe, resources (including financial, material, and personnel resources), and human capacity available for replication?</p> <p>What challenges to replication might arise from changes in the environment (including financial, political, security, research, and innovation-related changes)?</p>	<ul style="list-style-type: none"> • Project document study (monitoring and evaluation or project performance plans, progress reports, technical reports, program briefs, budget reports, etc.) • Desk and literature reviews of other projects and studies, national sector development plans, relevant policies and strategies • Targeted interviews with stakeholders • Project document study, particularly progress reports • Monitoring relevant news and media outlets • Close communication with replication funder • Targeted interviews with stakeholders

Program Success

The lens of program success examines the degree to which the program has achieved its intended outcomes and impact. The criterion stems from post-implementation review approaches from ADB (2014) and DFID (2011). ADB (2014) uses a 5-point scale to document the overall development impact of a project, classifying impact from *excellent* (“a project with extraordinarily positive impact in the key dimensions relevant to it and to the investment environment, with virtually no flaws or negative impact,” p. 12) to *unsatisfactory* (“a project with no evaluated positive impact, or one with negative impacts on several subindicators that clearly outweigh the remaining positive aspects,” p. 12). DFID (2011) also uses a 5-point rating scale ranging from *A++* (“outcome substantially exceeded expectation,” p. 7) to *C* (“outcome substantially did not meet expectation,” p. 7) to classify the degree to which the intervention achieved anticipated results against outputs, outcomes, and impacts stated in the project’s log

frame. In the case of the present dissertation, *program success* is defined as the degree to which the program, or components of it, achieved its objectives to warrant replication. As such, this replicability criterion draws on these existing approaches and examines whether (a) the program achieved its objectives overall to warrant considering replication (adapted from ADB, 2014, and DFID, 2011) and (b) given results, which program components might be most promising and relevant for replication, as shown in Figure 20.

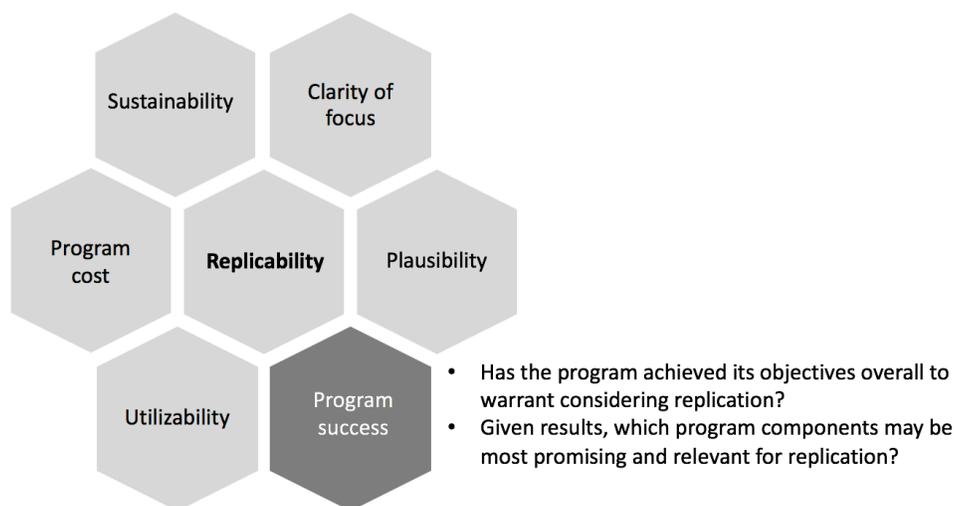


Figure 20. Guiding questions for examining replicability from the lens of program success.

Achieving Program Objectives

This aspect of the program success criterion examines whether the original intervention achieved its objectives. Approaches to this assessment might include desk review of data sets, project endline reports, technical reports on the intervention, presentations, and briefs as well as implementation site visits and interviews. In the case of the Ethiopia intervention, as stated in the study’s theory of change (Figure 13), the program anticipated three primary outcomes: (a) improved teacher attitudes toward inclusive education, (b) improved teacher self-efficacy for teaching students with sensory disabilities, and (c) increased teacher adoption of inclusive

instructional practices in regular reading classrooms. The following sections report on the study's findings for each.

Teacher attitudes toward inclusive education. As presented in Chapter 2 of this dissertation, at baseline, teacher attitudes toward inclusive education were already slightly positive. Participating teachers had a mean score of 34.51 (minimum = 10; maximum = 50; $n = 109$) on the teacher attitude toward inclusive education scale developed for the study. At endline (RTI, 2017a), participating teachers showed statistically significant ($p < .001$) improvements in their attitude toward students with mild to severe vision or hearing impairments, with a mean score of 40.97 ($n = 101$).

The dissertation author conducted additional analysis to explore possible predictors of positive teacher attitudes toward inclusive education. As reported in Chapter 2, at baseline, there was only one predictor of teacher attitude toward inclusive education, which was having a child with a known hearing impairment in the classroom (though only reported by a small number of participating teachers). No other factor, including teacher gender, age, training background, self-efficacy, or class size, emerged as a predictor of positive teacher attitudes toward inclusive education. At endline (RTI, 2017a), two factors arose. First, having a student with a known mental impairment in the classroom showed a positive relationship with teachers having more positive attitudes toward inclusive education (given the small number of teachers reporting on this item, results need to be considered with care). Second, teachers who reported having a head teacher who supported teachers' inclusive education also appeared to positively, and significantly ($p < .05$), affect teachers' attitudes toward inclusive education.

Exploring teachers' responses to individual items in the scale more closely highlights significant shifts in teachers' beliefs. Illustratively, at baseline, 64% of participating teachers agreed or strongly agreed that the needs of students with a vision or hearing impairment can best

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be served through special, separate classes. At endline (RTI, 2017a), only 13% of participating teachers still held that view. Similarly, 61% of participating teachers at baseline believed that the academic skills of students with a vision impairment or hearing impairment might be developed more rapidly in a special, separate classroom. At endline (RTI, 2017a), only 21% of participating teachers agreed or strongly agreed with this statement. In summary, the intervention appears to have been successful in improving participating teachers' attitudes toward inclusive education. Notable shifts in attitudes pertain particularly to teachers' beliefs about what type of classroom (regular classroom versus special classroom) may best meet the needs of students with sensory disabilities, with inclusion in regular classrooms becoming the dominant response option.

Teacher self-efficacy for teaching students with sensory disabilities. As presented in Chapter 2, teacher self-efficacy for teaching students with sensory disabilities also was slightly positive at baseline. Participating teachers had a mean score of 22.12 on the study's self-efficacy scale (minimum = 6; maximum = 30; $n = 109$). At endline (RTI, 2017a), this score improved significantly ($p < .001$) to a mean of 24.1 ($n = 101$). Multiple regression analysis did not yield teacher gender, age, training background, attitudes, or class size as a predictor of improved teacher self-efficacy. Only one factor, having a student with a known behavioral impairment in the classroom, showed a positive relationship with teachers having stronger self-efficacy for inclusive education (given the small number of teachers reporting also on this item, results need to be considered with care).

Exploring individual items in more detail, although 37% of teachers at baseline felt that they had sufficient expertise, knowledge, and skills to teach students with a sensory impairment in their regular classroom, over 70% of teachers shared this view at endline (RTI, 2017a). Similarly, although already a large proportion of teachers (76%) at baseline felt comfortable designing learning tasks appropriate for children with sensory impairments, this proportion

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increased even further, to 93% of teachers at endline agreeing with this statement (RTI, 2017a). In summary, the intervention appears to have positively affected participating teachers' sense of self-efficacy for teaching students with sensory disabilities. Teachers grew more comfortable addressing the learning needs of students with disabilities in their classrooms and felt better equipped in doing so.

Teacher adoption of inclusive instructional practices. As discussed in Chapter 2, at baseline, teachers' use of even foundational inclusive instructional practices, such as ensuring students are paying attention before an activity started or repeating questions at least once, was modest. By endline (RTI, 2017a), the proportion of classroom observations that indexed teachers frequently or always exhibiting the targeted behaviors had increased significantly. Illustratively, as shown in Figure 21, teachers were observed speaking loudly and clearly and facing the class when speaking more often at endline compared to baseline. Similarly, teachers were more likely to write questions on the board or repeat them at least once at endline compared to baseline (RTI, 2017a). Viewed holistically, findings from the study (RTI, 2017a) thus indicate that the program has achieved its objectives across all three targeted outcomes of (a) improving teacher attitudes toward inclusive education, (b) improving teacher self-efficacy for teaching children with sensory impairments, and (c) increasing teacher adoption of inclusive instructional practices.

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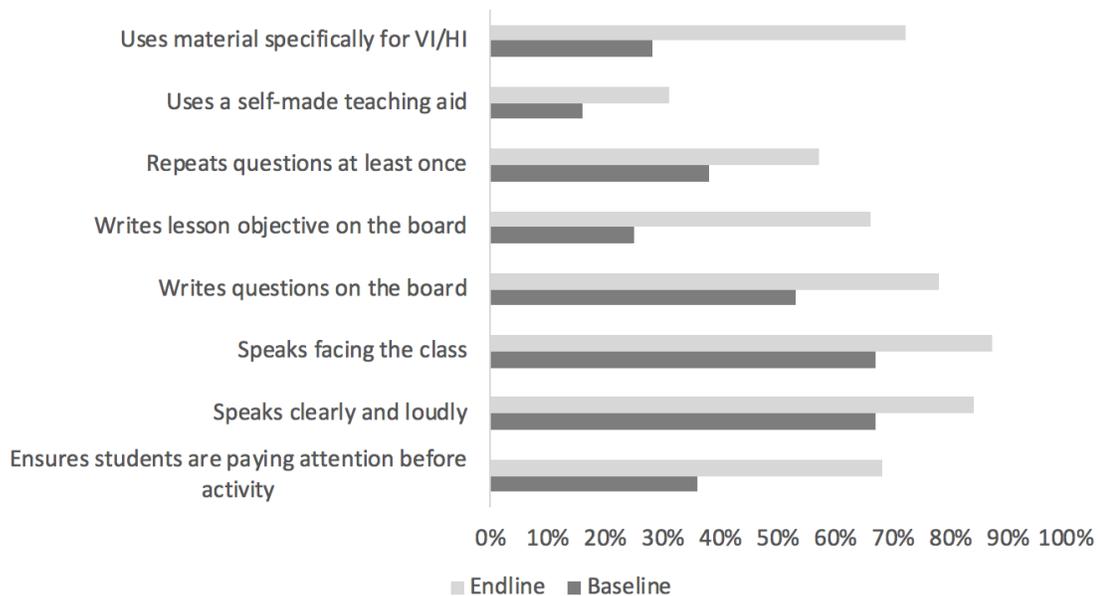


Figure 21. Percentage of classroom observations identifying teachers who frequently or always exhibited the stated behavior at baseline and endline. HI = hearing impairment; VI = visual impairment.

Promising and Relevant Program Components

This aspect of the program success criterion examines whether there are particular program components more promising than others in achieving project objectives relevant to replication. The ability to isolate the relative contribution of individual program components to the achievement on focal variables is particularly valuable in exploring replicability. Not all intervention components may be necessary to achieve desired outcomes, and removing those with limited impact may optimize cost-effectiveness and reduce the complexity of the replication. Isolating promising and relevant program components is greatly facilitated by the presence of a conceptual framework and clear operationalization of focal constructs. Aside from studying final project outcome data, where available, relevant data to examine the contribution of individual components might also come from program monitoring reports. Particularly where program monitoring includes systematic measurement of implementation fidelity, distinguishing

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features of the programs might be available to isolate and analyze (Dusenbury, Brannigan, Falco, & Hansen, 2003). Implementation site visits and targeted interviews with stakeholders may provide further qualitative insight into the promise of individual intervention components. In the case of the Ethiopia intervention, it was not possible to isolate the relative contribution of individual components of the intervention to the achievement of program objectives (e.g., the contribution of the group-based teacher training versus that of the classroom visits to improvements in teachers' attitude toward inclusive education), given the overall research design.

In summary, considering program success as part of a replicability framework addresses critical questions about the efficacy of a program. If designed, implemented, and analyzed with an eye toward clarity of focus and plausibility as described in the previous sections, program success can also be examined at the level of each program component. Such nuance can help program designers and implementers decide which, if not all, components to replicate in light of measurable pathways to impact and demonstrated results. Table 17 summarizes the relevant definitions, guiding questions, and approaches to examining the program success criterion for future interventions and studies.

Table 17

Overview of definitions, guiding questions, and approaches to examining program success

Definition	Guiding Questions	Approaches to Examining Program Success
Program success is the degree to which the program, or components of it, achieved its objectives to warrant replication.	<p>Did the program achieve its objectives overall to warrant considering replication?</p> <p>Given results, which program components might be most promising and relevant for replication?</p>	<ul style="list-style-type: none"> • Intervention data set study • Project document study, particularly endline reports, progress reports, program briefs, or presentations • Implementation site visits • Targeted interviews with stakeholders • Intervention data set study • Project document study, particularly program evaluation and implementation fidelity monitoring plans, or intervention progress or monitoring reports • Implementation site visits • Targeted interviews with stakeholders

Utilizability

Utilizability is a construct from evaluability assessment and refers to the degree to which findings from an evaluability assessment might contribute to changes in program design and implementation (Strosberg & Wholey, 1983). As such, utilizability also refers to stakeholders’ willingness to act upon evaluation results (Strosberg & Wholey, 1983). The lens of utilizability explores whether an evaluation might yield actionable, useful results and feedback that can serve program development or program improvement (Leviton et al., 2010). Utilization-focused evaluations, consistent with the overall pragmatic worldview adopted for this dissertation research in Ethiopia (see Chapter 4), aims to optimize the intended use of evaluation results by its intended users and stakeholders.

The dissertation author adopted Bryson and Patton’s (2010) definition of stakeholders for this dissertation: “individuals, groups, or organizations that can affect or are affected by an evaluation process or its findings” (p. 31). Approaches to exploring utilizability might include

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reviewing original intervention documentation and stakeholder analyses where available, as well as conducting a thorough stakeholder analysis for replication. In this dissertation, *utilizability* is defined as the degree to which relevant stakeholders are comprehensively identified, their anticipated use of program findings are made explicit, and their replication interests are examined. As highlighted in Figure 22, guiding questions for utilizability of the proposed replication framework thus include

- Who are the anticipated stakeholders (adapted from Bryson & Patton, 2010)?
- Is the anticipated use of program findings from the replication explicit across these stakeholders (adapted from Strosberg & Wholey, 1983)?
- How do stakeholders differ in their interest in replication (adapted from Strosberg & Wholey, 1983)?

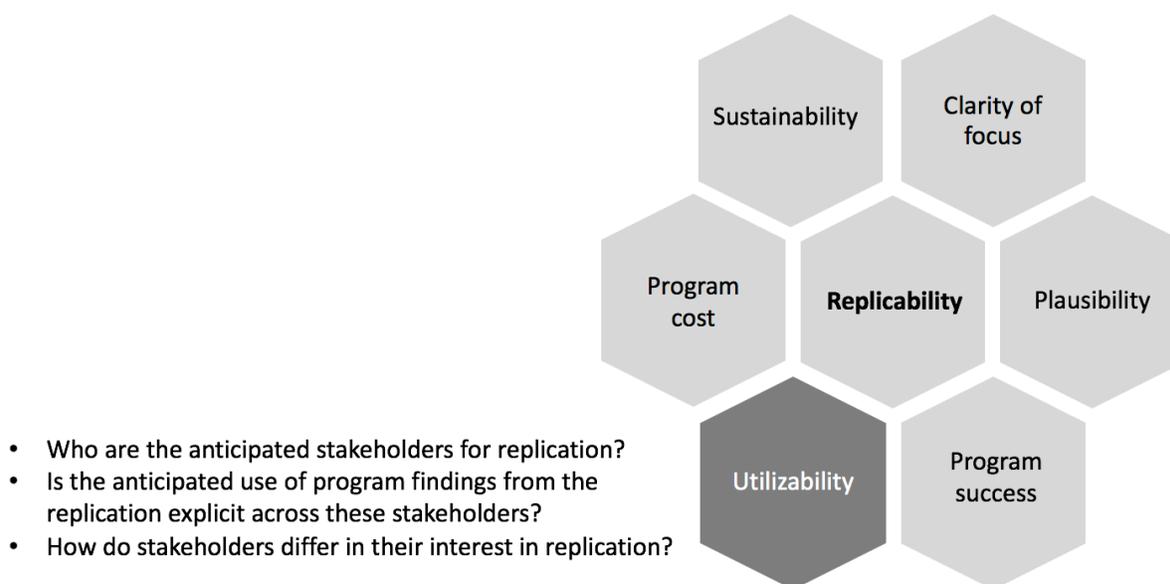


Figure 22. Guiding questions for examining replicability from the lens of utilizability.

Anticipated Stakeholders for Replication

This aspect of the utilizability criterion examines who might be the anticipated stakeholders for replication. In the case of the Ethiopia assistive technology intervention, the

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program engaged a diverse set of stakeholders. Main stakeholders included MOE staff at the central and regional level, colleges of teacher education reading and special needs experts, disabled persons organization (DPO) representatives, and READ TA project staff. Central to the initiative were also the participating school principals, teachers, and students, without which the initiative could not have been implemented. An additional critical stakeholder was the program's funding agency representative at USAID, who also had the authority to stop or significantly redirect the initiative.

In spite of the wide range of stakeholders actively engaged and considered in diverse aspects of the study, the initiative did not include a comprehensive stakeholder analysis at the outset of the program. As such, the study team did not consider the perspectives and interests of a number of relevant parties. These stakeholders were less directly engaged or affected by the implementation of the program and its evaluation, including Ethiopian and international researchers, educators, program designers, and donor agency representatives. Thus, while the dissertation author presented results from the study at a range of international conferences throughout 2017/2018, there were no blog posts, journal articles, newspaper columns, or similar mass dissemination of the program results in the year after the completion of the study. Thus, an opportunity was likely lost because these other actors might have had not only interest in but also access to funding for promptly replicating the intervention in Ethiopia or elsewhere. Systematic dissemination of study results in a wider range of forums likely would have garnered broader interest in the intervention and evaluation earlier on.

Explicit Use of Program Findings

This aspect of the utilizability criterion examines whether the anticipated use of program findings is explicit across relevant replication stakeholders. The Ethiopia assistive technology initiative, from the outset, was a highly participatory program. The initiative entailed the

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formation of working groups in each participating region, who in turn became central to program design, implementation, evaluation, and results dissemination. Working groups included staff from regional education bureaus, colleges of teacher education, DPOs, and special needs consultants, in addition to regional RTI staff, notably the regional READ TA gender and inclusion specialists.

The project team organized an initial one-day meeting at the regional level to introduce working group members to each other, outline roles and responsibilities of the working group, and share the overall purpose and schedule of the initiative. The project team then organized a rapid landscape scan in each region, with READ TA staff and working group members jointly visiting three to five regular and special needs schools to get a first impression of conditions at the school level. The rapid landscape scan included informal data collection on the availability of assistive technologies at these different school sites.

In April 2016, the project team organized a four-day co-design workshop for all working group participants together. In addition to regional working group participants, representatives from the MOE Special Needs Directorate and the MOE Center for Technology, as well as representatives from the Ethiopian Association for the Blind and the Ethiopian Association for the Deaf, participated and contributed to the workshop. The workshop entailed a combination of lectures (e.g., on findings of the rapid landscape review, inclusion from a more conceptual perspective, policy and legal aspects to inclusion in Ethiopia, and monitoring and evaluation), experiential activities (including exploring inclusive instructional classroom practices from a teacher perspective), demonstrations of a range of assistive technologies, and group work. Working group members jointly designed the assistive technology initiative during this workshop, each contributing their respective expertise and mandate, and drafted an initial action plan for each of their regions. The dissertation author designed a template to structure this action

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plan process. The template explicitly required each region to state its target group, what problem the intervention would address, what success of the intervention would look like, and a description of the main activities and regional cost drivers of the proposed program. As such, the action plans included explicit statements about anticipated results of the intervention.

The result of the co-design workshop was the general design of the intervention, as described in Chapter 4, on study intervention procedures. The co-design workshop was instrumental in developing technical credibility for the design of the intervention and a shared vision for the anticipated outcomes of the intervention at its outset.

Stakeholder Differences in Their Interest in Replication

This aspect of the utilizability criterion examines whether stakeholders differ in their interest in the replication and their relative influence on its implementation. Aside from a theoretical stakeholder analysis, a co-design workshop or event might yield important insights into stakeholder differences in their interest in replication. In the case of the Ethiopia intervention, actively engaging a wide range of stakeholders in intervention design, implementation, and evaluation not only built important local capacity along all of these program components but also generated a sense of ownership for study findings. Following endline data collection and analysis, as described in Chapter 4, the READ TA project team organized dissemination workshops in each participating region, as well as one national event. During the workshops, the dissertation author and READ TA project staff led the presentations on the quantitative study findings, reporting out along the anticipated outcomes of teacher attitudes, self-efficacy, and adoption of inclusive practices. The dissemination workshops were purposefully designed also to give voice to diverse stakeholders and to share their varied experiences. Working group members not only participated but also gave presentations and

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facilitated group activities and discussions. Regional workshops also included the participating teachers and principals who added their personal reflections, further validating results.

Tangible outputs of the dissemination workshops were regional follow-up actions that outlined how stakeholders were planning on using the experience and results from the initiative. Illustratively, some participating schools committed to scaling up the disability screening activities beyond original classrooms and grades; similarly, some regional education bureaus committed to expanding the initiative to additional schools, considered expanding the screening program to their itinerant teachers, and planned to more broadly share results in the region.

Considering replicability of this or other interventions, comprehensive stakeholder analysis is a critical tool to systematically examine the potential interests of a wide range of stakeholders early on. To illustrate a potential format for such an analysis, the dissertation author developed a comprehensive stakeholder analysis for the Ethiopia assistive technology initiative post hoc (Appendix I) and followed the techniques of Bryson and Patton (2010). The stakeholder analysis highlights how stakeholders vary in their interest in the program and its evaluation. For each stakeholder group, the dissertation author also considered what is needed to successfully implement the program and the evaluation and what each group's respective influence might be on either the program implementation or its evaluation. The stakeholder analysis also includes considerations of potential issues with each stakeholder, as well as their relative importance to the overall intervention and evaluation.

In summary, the criterion of utilizability can help program implementers and designers systematically explore who the stakeholders relevant to replication of the intervention are, what their interests in program implementation and evaluation are, and how their use of anticipated results might differ. Furthermore, a comprehensive stakeholder analysis can help systematically examine technical credibility, political legitimacy, and acceptance of findings when considering

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replication (Bryson & Patton, 2010). Table 18 summarizes the relevant definitions, guiding questions, and approaches to exploring the utilizability criterion for future interventions and studies.

Table 18

Overview of definitions, guiding questions, and approaches to examining utilizability

Definition	Guiding Questions	Approaches to Examining Utilizability
Utilizability is the degree to which relevant stakeholders are comprehensively identified, their anticipated use of program findings are made explicit, and their replication interests are examined.	<p>Who are the anticipated stakeholders for replication?</p> <p>Is the anticipated use of program findings from the replication explicit across these stakeholders?</p> <p>How do stakeholders differ in their interest in replication?</p>	<ul style="list-style-type: none"> • Review of original project documents and stakeholder analysis, where available • Replication stakeholder analysis • Replication intervention co-design workshops or events

Program Cost

The criterion of program cost is central to the question of replication. Selecting an intervention for implementation involves considering likely outcomes but also its cost in light of alternatives. In its project completion reviews, DFID examines cost from the perspective of value for money, which ensures that “programmes represent economic, efficient and effective use of funds for the desired objective” (2018, p. 20). This perspective includes buying products and services by maximizing market forces and competition, spending funds well in consideration of the quality of products and services, and spending funds wisely in an effort to maximize and accelerate program outcomes (DFID, 2018). DFID (2018) also highlights a concern for equity, which could be a justification for higher investments depending on context. Adding another consideration, ADB (2014) examines project costs from a perspective of what would have happened in the absence of the intervention. The bank indicates that

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a critical element in estimating the economic return of a project or enterprise is an assessment of the “without-project” scenario. Experience suggests that “without-project” outputs are frequently underestimated, i.e., the attribution of incremental benefits to the project exceeds what can be justified in the light of what would reasonably have happened without the project. (ADB, 2014, p. 57)

This perspective points to the efficacy of causal research that helps exclude potentially alternative explanations for results. Such research, however, is not always possible or desirable in international development contexts (New York University Development Research Institute, 2018). Thus, for the proposed replication framework, the dissertation author defines *program cost* as the degree to which main cost drivers for replication development, implementation, and research are identified and considered. The dissertation author examines program cost with the example of the assistive technology initiative in Ethiopia along three guiding questions (as highlighted in Figure 23):

- What are the main cost drivers of the program (DFID, 2011) relevant to replication?
- Are there remaining development costs in addition to implementation costs for replication?
- What are the research-related costs for replication?

Approaches to examining program cost might include a review of original intervention budgets, project progress reports, and interviews with stakeholders, especially where cost data might not be publicly accessible. Drafting an early replication budget, including development, implementation, and research-related costs, can also help guide replicability assessment and replication design.

- What are the main cost drivers of the program relevant to replication?
- Are there remaining development costs in addition to implementation costs for replication?
- What are the research-related costs for replication?

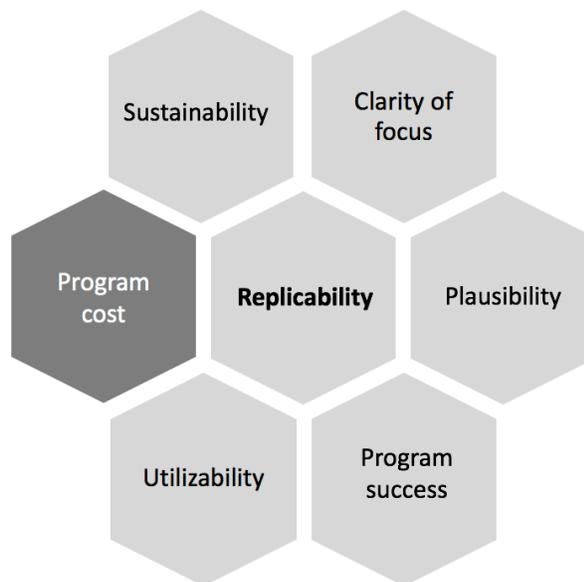


Figure 23. Guiding questions for examining replicability from the lens of program cost.

As outlined in Chapter 4, the final Ethiopia assistive technology intervention had four components: (1) screening students for sensory impairments and informing teachers of the results, (2) providing teachers with multimedia instructional materials (lesson plans) with explicit accommodations for children with visual or hearing impairments, (3) four days of teacher professional development, and (4) two classroom visits per participating teacher. The next sections discuss the main cost drivers of the intervention as well as program development, implementation, and research-related costs.

Cost Drivers of the Program

This aspect of the program cost criterion examines the main cost drivers of the intervention to be replicated. In the case of the Ethiopia intervention, as highlighted in the intervention timeline in Figure 12 in Chapter 4, as well as under inputs in the intervention logic model in Appendix E, a range of activities led to the implementation of each of the intervention components across the five participating regions of Ethiopia. Table 19 lists the main activities and implementation details. The table also shows an overall cost ranking for each, with one (1)

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denoting the costliest and 14 the least costly activity of those presented. The table is a simplified view of the main cost drivers of the intervention focusing on labor (represented in person-days), per diem, and material cost.

The dissertation author established the ranking based on cost data from unpublished READ TA annual implementation plans, which included cost estimates for each activity and were formally submitted to and approved by USAID each year. Estimates from this table also include data from READ TA annual progress reports submitted by RTI to USAID (RTI, 2016b, 2017b) as well as from the direct experience of the dissertation author, who designed, implemented, and oversaw these activities. Participant numbers are based on actual READ TA data from these reports, where available, or the dissertation author's estimates, where necessary.

Table 19

Overview of intervention design and implementation inputs and cost weightings for each

Input/Activity	Implementation Detail	Total Estimated Person-Days	Total Estimated Per Diem Days	Cost Ranking
Conduct consultative workshops and establish assistive technology regional working groups	Implementation: After conducting a consultative meeting with the MOE, the READ TA team held consultative workshops with regional education bureaus, colleges of teacher education, and DPO representatives to introduce the assistive technology initiative and establish the regional working groups. Sessions: 5 (1 per region) Duration of session: 1 day Estimated participants per session: 16–17 per region	82	0	12
Rapid inclusive education situation analysis in each region	Implementation: The team collected data on inclusive education from the regional education bureaus; select working group members and READ TA staff visited 3–5 schools per region. Sessions: 5 (1 per region) Duration of session: 4 days ^a Estimated participants per session: 5 per region ^a	100	25	10
Co-design workshop: Identify assistive technologies and develop intervention action plans for each region	Implementation: Working group members, MOE and DPO representatives, and READ TA staff identified the purpose of the intervention, target group, anticipated outcomes, and relevant technologies, as part of a co-design workshop, and prepared action plans for each region. Sessions: 1 central Duration of session: 4 days	220	27	4

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		Estimated participants per session: 55		
Validate action plans for pilot assistive technology projects	<p>Implementation: Leadership from regional education bureaus reviewed and validated regional action plans.</p> <p>Sessions: 5 (1 per region)</p> <p>Duration of session: 1 day</p> <p>Estimated participants per session: 11 (regional education bureau and READ TA staff)</p>	55	0	14
Procure assistive technologies and screening software	<p>Implementation: READ TA staff procured technology and materials for each of the 109 participating teachers and classrooms. Procurement efforts included quotation preparation and evaluation, procurement order finalization, and monitoring shipment by READ TA operational staff.</p> <p>Sessions: n/a</p> <p>Duration of session: n/a</p> <p>Estimated participants per session: n/a</p>	US\$62,675 (US\$575/teacher)		2
Develop accommodated multimedia teacher guide in seven mother tongues	<p>Implementation: READ TA staff and select working group members jointly developed accommodations for each lesson plan for the relevant part of the school year and in each mother tongue. READ TA staff recorded remaining audio files and developed the final multimedia version of the accommodated teacher guide.</p> <p>Sessions: 1 central</p> <p>Duration of session: 4 days</p> <p>Estimated participants per session: 11 (working group and READ TA staff)</p>	44	55	6
Quality assure and validate accommodated multimedia teacher guide	<p>Implementation: Participants from working groups, regional education bureaus, and MOE quality assured and validated the accommodated multimedia teacher guides in each mother tongue.</p> <p>Sessions: 1 central</p> <p>Duration of session: 4 days</p> <p>Estimated participants per session: 17</p>	68	85	7
Develop training manual in seven languages	<p>Implementation: Central READ TA staff developed the English master version of the teacher training manual; regional READ TA staff and working group representatives jointly adapted the teacher training manual into each mother tongue.</p> <p>Sessions: 1 central</p> <p>Duration of session: 5 days</p> <p>Estimated participants per session: 15^a</p>	60	90	8
Quality assure and validate training manual	<p>Implementation: Participants from working groups, regional education bureaus, and MOE quality assured and validated the teacher training manual in each language.</p> <p>Sessions: 1 central</p> <p>Duration of session: 2 days</p> <p>Estimated participants per session: 11 (regional education bureau and READ TA staff)^a</p>	110	165	5
Materials test	<p>Implementation: 12 teachers (not selected for participation in the intervention) from 2 schools tested the accommodated multimedia teacher guide over the course of 1 week.</p> <p>Sessions: 1 at 2 central schools</p> <p>Duration of session: 5 days</p> <p>Estimated participants per session: 12 (teachers)</p>	60	0	13

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Training of trainers	<p>Implementation: READ TA central staff trained the READ TA regional staff who then served as trainers for the regional participant trainings.</p> <p>Sessions: 1 central</p> <p>Duration of session: 3 days</p> <p>Estimated participants per session: 21 (READ TA staff)^a</p>	21	84	9
Provide initial training to teachers and principals	<p>Implementation: READ TA regional staff and select working group members trained teachers and principals from participating schools in each region.</p> <p>Sessions: 5 (1 per region)</p> <p>Duration of session: 2 days</p> <p>Estimated participants per session: Up to 25 teachers and school leaders from pilot educational institutions, 5 READ TA and working group members per region (total of 188 participants)</p>	376	564	1
Provide refresher training to teachers and principals	<p>Implementation: READ TA regional staff and select working group members provided refresher training for teachers and school leaders from participating schools.</p> <p>Sessions: 5 (1 per region)</p> <p>Duration of session: 2 days</p> <p>Estimated participants per session: Up to 25 teachers, leaders, and principals from pilot educational institutions, 5 READ TA and working group members per region (total of 194 participants)</p>	388	582	1
Implement assistive technology initiative	<p>Implementation: READ TA staff and working group representatives conducted two monthly visits to participating classrooms and provided pedagogical support to teachers.</p> <p>Sessions: 126 (monthly at each school)</p> <p>Duration of session: 8 days</p> <p>Estimated participants per session: 3 (READ TA staff and working group members per region)^a</p>	48	54	11
Share evaluation findings and recommendations at central level	<p>Implementation: At the central workshop, working group members, regional education bureaus, MOE and DPO representatives, and READ TA staff shared findings from the intervention research and experiences of working group participants and discussed the way forward.</p> <p>Sessions: 1 central</p> <p>Duration of session: 2 days</p> <p>Estimated participants per session: 42</p>	84	126	3
Share evaluation findings and recommendations in each region	<p>Implementation: At regional workshops, working group members, regional education bureaus, DPO representatives, participating school representatives, and READ TA staff shared regional findings from intervention research and experiences of school participants and discussed the way forward.</p> <p>Sessions: 5 (1 per region)</p> <p>Duration of session: 1 day</p> <p>Estimated participants per session: Up to 50 participants per region, including teachers and school leaders (total of 245 participants)</p>	245	490	3

Note. Total estimated person-days are the product of the number of sessions, the days of duration of each session, and the number of participants per session, as applicable. The total estimated per diem days are the product of the number of sessions, the days of duration of each session, and the number of participants per session, plus two half-days for travel per participant. The actual costs of a person-day, which varies among international READ TA staff, Ethiopian READ TA staff, MOE and DPO representatives, and teachers and school leaders, did not factor into this

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calculation. Such personnel costs, however, may significantly affect design and implementation costs of the intervention in a given context. Cost rankings are calculated on a scale from 1 (costliest) to 14 (least costly). DPO = disabled persons organizations; MOE = Ministry of Education; READ TA = Reading for Ethiopia's Achievement Developed Technical Assistance project.

^aDissertation author's estimations.

As shown in Table 19, the main cost drivers of the intervention were the combined four days of teacher training, the equipment and software licenses for each teacher, and the dissemination activities. Concerning the former, the overall cost was driven by the large number of school-based participants who traveled to a central location twice and needed overnight stays and per diem. The equipment and software license costs were driven by the price of one smartphone, one calibrated headset, and unlimited screening licenses for the vision and hearing screening tools, for each teacher. The READ TA team procured the headsets, as well as special foam cases for their protection from the often dusty school environments, directly from the screening software vendor in South Africa. The dissemination activities were significant cost drivers of the intervention because they entailed one central two-day workshop with 42 participants traveling and staying overnight, as well as regional dissemination workshops, which required over 200 persons to travel to a central regional location and, for many, stay overnight.

The intervention co-design workshop, the quality assurance effort for the teacher training manual, and the development of the accommodated multimedia lesson plans also were notable costs in intervention development and implementation. The development entailed recording all phonemic awareness and story exercises from the student book and teacher guide developed in 2015/2016 for another activity of the larger READ TA project and required mother tongue speakers from each of the languages. The process also entailed a team of READ TA inclusion and reading experts, together with working group representatives, to develop and integrate specific accommodations for each lesson and in each of the mother tongue languages. Given the three-month timeline of the intervention, with a reading lesson for every day, this effort required the team to develop accommodations for up to 60 lessons per language, for a total of 420 lessons

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across the seven mother tongues. After developing the recordings and writing the accommodations, the team then had to enter each lesson into an online editor. From the online editor, the dissertation author then extracted language-specific apps for installation on the teachers' smartphones. Although this effort only needed to be done once per language, it was labor intensive, which explains the notable differences between the development and implementation costs of the program described in the next section.

Development and Implementation Costs of the Program

This aspect of the program cost criterion examines both the original development and implementation costs of the intervention and whether there might be remaining development costs in addition to ongoing implementation costs for replication. In the case of the Ethiopia initiative, as shown in Table 19, cost drivers of the Ethiopia assistive technology intervention stemmed from a combination of development and implementation activities. Table 20 classifies each input as either an intervention development activity, which might not be needed at replication, or an implementation activity included also in the replication, retaining the cost estimates for each.

Table 20

Classification of intervention activities into development and implementation costs

Input/Activity	Development Cost	Implementation Cost
Conduct consultative workshops and establish assistive technology regional working groups	X	
Rapid inclusive education situation analysis in each region	X	
Co-design workshop: Identify assistive technologies and develop intervention action plans for each region	X	
Validate action plans for pilot assistive technology projects	X	
Procure assistive technologies and screening software		X

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Develop accommodated multimedia teacher guide in seven mother tongues	X	
Quality assure and validate accommodated multimedia teacher guide	X	
Develop training manual in seven languages	X	
Quality assure and validate training manual	X	
Materials test	X	
Training of trainers		X
Provide initial training to teachers and principals		X
Provide refresher training to teachers and principals		X
Implement assistive technology initiative		X
Share evaluation findings and recommendations at central level	X	
Share evaluation findings and recommendations in each region	X	

As shown in Tables 19 and 20, the majority of the intervention activities were investments related to the development of the intervention. Notably, these investments included the original co-design workshop and the development, quality assurance, and validation of the accommodated multimedia lesson plans. Development costs also included the drafting, quality assurance, and validation of the teacher training manual, as well as the comprehensive results dissemination activities at the central and regional level. The two primary cost drivers of the intervention, based on the rankings in Table 19, are both implementation costs. To replicate the Ethiopia assistive technology intervention, minimum inputs likely include procuring the equipment and software package for each teacher, training a new group of teacher trainers, training teachers and school leaders in replication classrooms, and implementing the activity, including monthly monitoring visits to each replication classroom.

Depending on the purpose and anticipated outcomes of replication, however, program designers may choose to include inputs such as a co-design event or results dissemination workshops as part of their implementation. Drawing on lessons learned from implementation science (Bryk, Gomez, Grunow, & LeMahieu, 2015), some form of co-development and active

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engagement, including a networked improvement community, by participating teachers and principals might increase the likelihood for replication success. From this lens, replication program designers might not only acknowledge but also anticipate variation in performance among teachers and differences in implementation contexts. With this perspective, replication program designers might also be able to look at replication from a systems lens, recognizing complexities and dynamics that might affect implementation (Bryk et al., 2015), or allow for institutionalization rather than implementing a replication pilot project in another context.

Research-Related Costs to Replication

This aspect of examining program cost specifically assesses potential research expenditures related to the replication. Table 19 lists relevant cost data from the Ethiopia initiative but does not include investments related to the research component of the intervention. Such investments included instrument development, instrument testing and refinement, progress monitoring, and baseline and endline data collection, data analysis, and report writing. Depending on the strength of the evidence for a given intervention approach, a replicability analysis should also consider research-related costs for the replication. This decision and the design of the replicability research should be informed by the available information from the original study in consideration of noted study limitations, remaining questions, and unexpected outcomes or to increase the rigor of a replication study.

In the case of the Ethiopia intervention, the dissertation author and RTI team planned the Ethiopia assistive technology initiative as a proof of concept. At the time of the intervention design, no similar effort providing teachers with assistive technologies to promote the adoption of inclusive instructional practices in regular classrooms had been implemented in Ethiopia or published in the English-language peer-reviewed literature elsewhere. When designing the implementation, however, the dissertation author faced initial resistance from members of the

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working groups. Some representatives felt that the intervention should target a broader set of disabilities. Others requested assistive technologies for individual children or inclusion of more schools in the sample.

In spite of these demands, the READ TA team was able to keep the scope and sample small, pointing to the early stage of the intervention, the needed flexibility to adapt the intervention based on results from the process monitoring efforts, and the need to ensure responsible investment of project funds. As a result, the intervention did not feature a control group of teachers, which presented limitations in establishing reliable relationships between focal variables, identifying predictors, and excluding competing explanations for results (RTI, 2017a; see also the section on clarity of focus). A replication of the intervention as implemented in 2016/2017 would ideally include a more rigorous outcome evaluation research design. Similarly, the design of the initial implementation did not include a group of classrooms in which teachers were informed of their student’s vision or hearing screening results but did not participate in the accompanying intervention. Such research could shed light on the potential relative contribution of identification (screening information only) versus accommodation (intervention with accommodated lesson plans) to teachers’ behavior change. Table 21 summarizes the relevant definitions, guiding questions, and approaches to examining the program cost criterion for future interventions and studies.

Table 21

Overview of definitions, guiding questions, and approaches to examining program cost

Definition	Guiding Questions	Approaches to Examining Program Cost
Program cost is the degree to which main cost drivers for replication development, implementation, and	What are the main cost drivers of the program relevant to replication? Are there remaining development costs in addition	

research are identified and considered.	to implementation costs for replication? What are the research-related costs for replication?	<ul style="list-style-type: none"> • Intervention budget review • Project document study, especially progress reports • Targeted interviews with stakeholders • Design replication budget, considering replication-specific development, implementation and research costs
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Sustainability

In 1987, the World Commission on Environment and Development defined sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission on Environment and Development, 1987). This definition continues to be relevant decades later as demonstrated by its adoption of the Sustainable Development Goals (SDGs; UN, 2015). While often strongly connotated with environmental concerns (e.g., the reduction of greenhouse gas emissions; ADB, 2014), the SDGs entail a broader understanding of sustainable development aimed at creating lasting benefits across economic, environmental, and social domains (UN, 2015). For education specifically, the SDGs aim to achieve “inclusive and equitable quality education and promote lifelong learning opportunities for all” (UN, 2015), which directly relates to the overall problem of practice framing this dissertation—that is, the low school enrollment of children with disabilities in low- and middle-income countries.

For the proposed replicability framework building on the example of the assistive technology initiative in Ethiopia, this dissertation defines *sustainability* as the degree to which relevant lessons from the intervention have been considered and the benefits of replication are likely to be sustained in a given system. The dissertation author examines sustainability through two main questions (as highlighted in Figure 24):

- What is the likelihood that benefits of the intervention can be sustained beyond the lifetime of a project in consideration of the financial, material, and human resources

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required (adapted from DFID, 2011) as well as system-level factors including prevailing policies and organizational structures?

- What are relevant lessons learned from the implementation of the intervention that may affect replication, especially as they pertain to economic, environmental, or social aspects?
- What is the likelihood that benefits of the intervention can be sustained beyond the lifetime of a project in consideration of the financial, material, and human resources required as well as system-level factors including prevailing policies and organizational structures?
- What are relevant lessons learned from the implementation of the intervention that may affect replication, especially as they pertain to economic, environmental, or social aspects?

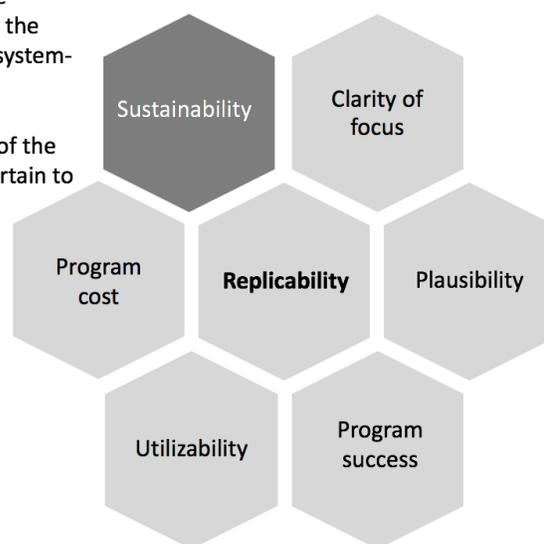


Figure 24. Guiding questions for examining replicability from the lens of sustainability.

Sustaining Benefits Beyond the Life of the Project

This aspect of the sustainability criterion examines whether the benefits of the program can be sustained beyond the life of the project, including at replication. Approaches to this assessment might entail the review of intervention documentation, intervention budgets, implementation site visits, and targeted stakeholder interviews. Approaches might also include reviewing sector plans, policies, and strategies to understand the bigger system context of implementation. In the case of the Ethiopia intervention, as described in the sections on plausibility and program cost, the intervention required not only financial and personnel resources to develop and implement but also specific materials and human capacity. Experience

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from this intervention also highlights the role system-level factors might play in the efficacy and replicability of an intervention.

Financial and personnel resources and human capacity. Concerning the financial and personnel resources, the Ethiopia intervention had costs related to participant travel and per diem for the teacher and principal training. For replication, program designers would also need to consider the cost of trainers for these events, including their professional fee, travel, and per diem. Similarly, there are transportation and per diem costs for regular classroom visits to participating teachers. Depending on context, there might be existing positions or functions in an education system that might take on these classroom visits; illustratively, the position of a school cluster supervisor in Ethiopia entails in-service teacher training (Save the Children, 2014). The READ TA team successfully studied the potential of building on this existing function for teacher mentoring in early reading instruction (RTI, 2018), raising it as a possible sustainable opportunity to institutionalize classroom-level support to teachers' inclusive instruction.

For the Ethiopia assistive technology initiative, the READ TA project budget covered the travel and per diem costs for the training and for school visits conducted by teams of READ TA staff and members of the working group. The latter included regional education bureau staff, lecturers from colleges of teacher education, and representatives from a range of organizations and DPOs, as described in the section on utilizability. The highly participatory nature of the Ethiopia assistive technology intervention not only strengthened political acceptance and technical credibility but also built local capacity beyond READ TA staff. Working group members participated in the development of the teacher training manual and the accommodated lesson plans and co-delivered training sessions and classroom monitoring visits. This effort provided a pool of possible trainers or classroom visit support personnel in each mother tongue language and region to draw on for replication.

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Considering the noticeable costs for personnel, training, and support, the potential to re-design parts of the intervention might be more cost-effective. However, no data are available to suggest whether it is possible to reduce cost this way. As such, it is unclear whether benefits might be sustained if, for example, principals are not invited to the refresher training or the number of classroom visits are reduced. Likely, such changes would negatively affect the efficacy of the intervention given what current international research suggests about effective teacher professional development (e.g., Darling-Hammond, Hyler, Gardner, & Espinoza, 2017). This evidence base highlights the importance of professional development that is ongoing and long term, focuses on pedagogical content knowledge, and actively engages teachers, including in collaborative activities. Such teacher professional development also ensures that teachers understand what is expected of them, can access models of good practices, and receive expert feedback and coaching and leadership support (Darling-Hammond et al., 2017).

Material resources. The quality and detail of the documentation and materials for an intervention might also play a role for replicability. The dissertation author and READ TA staff purposefully developed very detailed training manuals (Appendix G) as well as published accommodation guidance notes to assist potential scale-up or replication efforts and to maintain consistency in intervention implementation. Also, the classroom observation tool (Appendix B) can help guide classroom visits and standardize observational metrics across persons and replication efforts. However, given the time lag between the initial intervention in 2016/2017 and the finalization of this dissertation in 2019, a refresher training might be necessary even for former local READ TA staff to ensure quality and fidelity of future replication efforts.

There were also costs to the special materials required for the Ethiopia intervention, which included the smartphone (under USD\$100 per phone depending on model) and headset (under USD\$120 per headset with case depending on model) for each teacher, as well as

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software licenses for the hearing and vision screening tools (under USD\$300 per tool and per year for unlimited screening per combined depending on procurement location; hearX, 2018). There was an additional cost for calibrating the headsets to the specific smartphone (likely under USD\$120 per headset; hearX, 2018), which is required annually to ensure the integrity of the hearing screening. Recalibration also requires budget and logistical effort for annually shipping all headsets to South Africa. While these costs and logistics are likely possible for an implementing organization of a donor-funded project to bear, they might present considerable limitations to a regional government or local DPO. For replicating the Ethiopia assistive technology intervention at scale, a more sustainable solution may be needed, which may include, for example, identifying or establishing a local recalibration facility. Furthermore, while the cost of the screening licenses and related technology of this intervention is significant in a context like Ethiopia, each device can serve unlimited screenings. This advantage might introduce economies of scale related to the ability to screen substantial numbers of children over the course of a subscription year, particularly if equipment is shared across teachers.

The accommodated multimedia lesson plan required a significant initial investment to develop (Table 19). The dissertation author used an open source software platform developed by RTI for publishing the app. Not only is the source code of the app available to the public, but the dissertation author also distributed copies of the app in each of the seven mother tongue languages to each of the regional education bureaus in Ethiopia, as well as the MOE and USAID for sharing with interested parties. While the intervention only targeted one semester of the Grade 2 school year initially, given the promising results and stated interest of participating teachers (RTI, 2017a), the RTI team not only accommodated the rest of the Grade 2 teacher lesson plans but also all those of Grade 1. There should thus be no cost to using the accommodated multimedia lesson plans for replication.

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System-level factors. Based on personal communication with DPOs and working group members, there are significant gaps in accessing alternative screening services especially in the rural areas of Ethiopia. Working group members and READ TA staff noted informally that the sophistication of the intervention’s screening technology far exceeded the equipment available at local health centers, especially for hearing screening. This feedback suggests gaps in the country’s health system, which is consistent with findings from the empirical research also summarized in Chapter 1 on exosystem-level drivers of the low school enrollment of children with disabilities (Geda et al., 2016; Tamrat et al., 2001). The issue of access to alternative screening services, as well as the formal medical evaluations required following a positive screening result, will necessitate careful consideration for replication program designers.

This example stresses the importance of understanding the larger system within which the intervention and replication take place, which is also a central element for program scale-up in the improvement science literature (Bryk et al., 2015). From this perspective, it is essential to consider the political dynamics, prevailing policies, and organizational structures and norms that have generated the current situation (Bryk et al., 2015) and might affect replication, especially at scale. Illustratively, prevailing policies might be a significant driver, or a barrier (see Chapter 1; Malle et al., 2015; MOE, 2016b), to intervention replication. In the case of Ethiopia, given the country’s ambitious inclusive education policy and political commitment, prevailing policies should favor replication of an initiative aligned with those objectives.

In summary, this analysis revealed that replication of the intervention in Ethiopia likely would benefit from support in exploring more sustainable solutions for headset calibration, planning for sustained teacher training at scale, and testing models for institutionalizing ongoing teacher support. At the same time, important elements to sustaining benefits are already in place. These benefits include local capacity and collaborative experience among regional education

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bureau staff, colleges of teacher education staff, and DPO representatives. The replicability assessment of the example of the Ethiopia intervention also suggests that cost-efficiency options for sustained implementation, related requirements for institutionalizing human capacity, and system factors (e.g., relevant policies and organizational structures) are critical perspectives in assessing the sustainability of an intervention.

Lessons from the Intervention Relevant for Replication

This aspect of examining sustainability seeks lessons learned from the original intervention that might be relevant for the replication. Approaches to exploring such lessons might include implementation site visits, targeted stakeholder interviews, and project document study. Such lessons might touch upon economic, environmental, or social domains. In the case of Ethiopia, lessons are related to technology use cutting across social and environmental domains and to parental access to medical evaluation services cutting across social and economic domains.

Lessons in the social and environmental domain. Lessons related to the Ethiopia technology package are relevant for sustainability and replication. Informally, READ TA staff and working group representatives expressed concerns about the effective and sustained use of the assistive technology. These concerns included teachers' access to stable power sources to charge the phones and their ability to care for the devices responsibly. The dissertation author purposefully designed the intervention so that, if cared for responsibly and used appropriately, the equipment package could be retained by participating schools following the intervention. This offer provided an incentive for principals and teachers to use the equipment as intended. During the entire period of the intervention (February 2017 to April 2017) and the months following (until October 2017), no devices were lost or broken among the 109 sets distributed across the five regions of Ethiopia. In a few instances, chargers were lost, but teachers and

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schools replaced them on their account. The overall equipment package also had a modest environmental footprint (e.g., regarding greenhouse gas emissions and waste), given that it was limited to a smartphone and a headset per teacher. Recycling and technology waste management, however, might be considerations at the stage of replication, especially at scale given the lack of systematic recycling and responsible waste management pervasive in countries like Ethiopia. To date, the experience from Ethiopia, however, points to the efficacy of that technology package in the given context and for this target group.

Lessons in the social and economic domain. Lessons related to communicating with parents and family's access to medical follow-up evaluations from the Ethiopia intervention are relevant for sustainability and replication. By design, disability screening efforts are rapid measures, are implemented by non-medical personnel, and generally vary in their degree of precision (Strigel, 2018). Screening efforts should thus accompany solutions for students accessing professional medical evaluation services. To this effect, the READ TA team provided referral slips to nearby health clinics for students who screened positive for a potential vision or hearing impairment. Anecdotal evidence from school principals indicates, however, that not all teachers handed out the referral slips to parents. Informal feedback from principals suggested that some teachers had concerns about parents' ability to read and understand the referral slip or about parents' ability to access and afford the follow-up medical evaluation costs. Informal feedback from principals also suggested that they held back referral slips until after intervention results came to light, to be able to tell parents not only about their child's potential sensory impairment but also about the efficacy of the school's actions in supporting their child's learning. This lesson speaks to the identified socio-cultural barriers and the prevailing stigma attached to disabilities identified in Chapter 1. Consequently, the question of how to best inform parents about the intervention, including the results of the related screening effort, requires careful

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attention and potentially systematic investigation for replication program designers. Table 22 summarizes the relevant definitions, guiding questions, and approaches to exploring the sustainability criterion for future interventions and studies.

Table 22

Overview of definitions, guiding questions, and approaches to examining sustainability

Definition	Guiding Questions	Approaches to Examining Sustainability
Sustainability is the degree to which relevant lessons from the intervention have been considered and the benefits of replication are likely to be sustained in a given system.	<p>What is the likelihood that benefits of the intervention can be sustained beyond the lifetime of a project in consideration of the financial, material, and human resources required as well as system-level factors including prevailing policies and organizational structures?</p> <p>What are relevant lessons learned from the implementation of the intervention that may affect replication, especially as they pertain to economic, environmental, or social aspects?</p>	<ul style="list-style-type: none"> • Project document study, especially progress reports, budget documentation, endline reports, and technical reports • Desk and literature reviews of other projects and studies, national sector development plans, relevant policies and strategies • Targeted interviews with stakeholders, including in tangential systems (e.g., health sector experts) • Implementation site visits • Targeted interviews with stakeholders • Project document study, especially progress reports

This chapter has included an examination of replicability from six lenses, using the Ethiopia assistive technology initiative as an example. The dissertation author assessed clarity of focus, plausibility, program success, utilizability, program cost, and sustainability along guiding questions adapted from the literature on evaluability assessment (Leviton & Lipsey, 2007; Leviton et al., 2010; Strosberg & Wholey, 1987) and post-implementation review (ADB, 2014; DFID, 2011) as well as the dissertation author's direct implementation and replication experience. In the process, the dissertation author confirmed these six criteria, formulated a set of guiding questions, and suggested approaches for assessing each criterion, resulting in a comprehensive framework for replicability, as illustrated in Figure 25.

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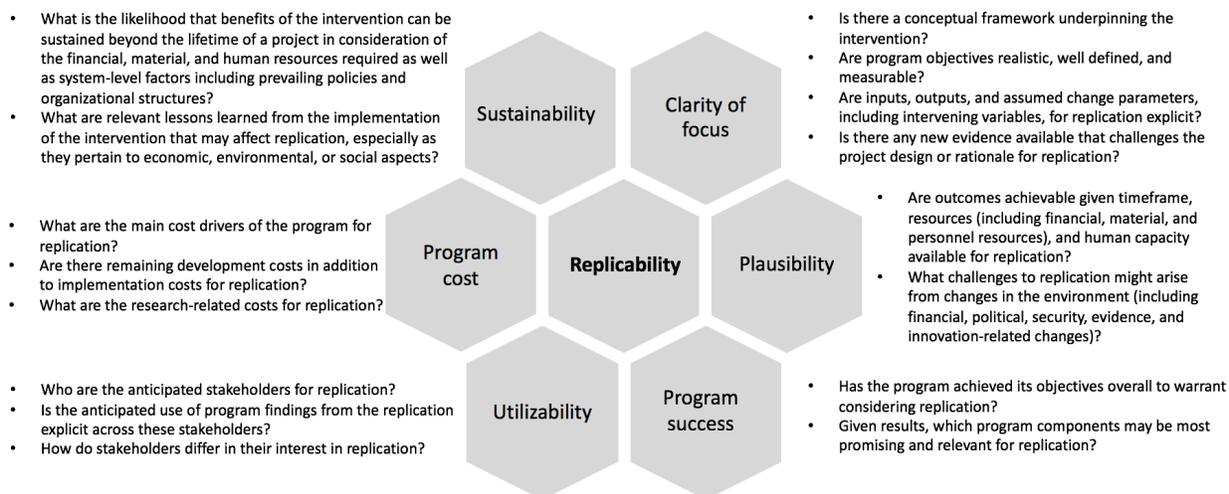


Figure 25. Final replicability framework with guiding questions for each of the six lenses.

Conclusion

The initial application of the replicability framework to the Ethiopia assistive technology initiative suggested that the intervention holds promise for replication, with certain considerations. Limitations regarding the clarity of focus criterion concern the capacity-building objective of the initiative, the cost of the specialized materials, and the logistical effort required for the annual recalibration of the headsets for reliable hearing screening. The analysis also suggests systemic weaknesses in accessing medical diagnosis and specialized support following the screening for some of the participating students and their families.

In spite of these limitations, a number of replication activities of the Ethiopia assistive technology initiative already took place. As described, during the dissemination workshops, several regional education bureaus and school representatives reported tangible replication activities in their locations. Several school principals and participating teachers continued to screen additional classrooms at their schools; others planned to expand screenings to additional schools. Furthermore, the Tigray education bureau communicated to the READ TA team that it had set aside nearly USD\$150,000 to scale up activities in their region. A local DPO from the Tigray region also reached out to the dissertation author, requesting further detail and support in

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procuring screening devices to expand the region's services. The World Bank in Ethiopia contacted the dissertation author in 2018 for reports and additional information on the intervention for consideration in a bank-funded research project on inclusive education in Ethiopia.

In addition, USAID Philippines, made aware of the Ethiopia experience, requested a proof of concept screening study in the Philippines to inform their inclusive education programming. RTI, under the leadership of the dissertation author, designed the resulting Philippines disabilities screening pilot and shared results from its research in October 2018 in Manila with USAID, the Philippines Department of Education, and local DPOs. Follow-up activities are currently underway.

In conclusion, the replicability analysis suggested that the Ethiopia assistive technology initiative shows promise for replicability across the six criteria of clarity of focus, plausibility, program success, utilizability, program cost, and sustainability. Tangible replication efforts in Ethiopia and elsewhere already taking place underscore this potential. Furthermore, these emerging replication efforts highlight demand for reliable data and promising strategies to help improve access to and quality of education for children with disabilities in low- and middle-income countries, addressing the dissertation's targeted problem of practice and further advancing the global SDGs agenda.

Concerning the proposed new framework for examining replicability of an intervention, this dissertation documented a first practical application of the framework on the example of the Ethiopia assistive technology initiative. Further research on the replicability framework is recommended to validate its utility in structuring and guiding the comprehensive examination of the replicability of different interventions in diverse contexts.

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Appendix A

Teacher Questionnaire

Tangerine

Teacher Questionnaire - English - Endline

Last Updated: 1495120927000

Enumerator Name

Date and time

Date

Time

Record ID

Record ID

Consent

Let me tell you why I am here today. I work with the Ministry of Education on an effort to improve reading and writing in mother tongue in Ethiopia. The new textbooks and teacher guides you are using were developed under the project, READ TA, that I am working for.

The reason why I am here today is that READ TA is now trying to understand what else may be done to help children that may have difficulty seeing or hearing learn how to read

We would like your help in this.

We would like to observe one of your reading classes to see how these children are doing in the classroom

Then we would like to interview you about your thoughts on inclusive education, your classroom, and your role as a teacher.

The intention of the interview is to ask your personal view on several items regarding the inclusion of students with disability in regular classrooms and schools in Ethiopia. For this survey, inclusive education is defined as integration of students with mild or moderate vision or hearing disabilities (not fully blind or deaf) into regular classrooms for 80% or more of the school day. Thus, when providing your answers, please particularly consider them regarding children with vision impairment and hearing impairment.

The information you will provide in this interview will be confidential to the best of our ability. Your real name will not be used in any publication or report.

The interview will take about 30 minutes to complete.

If you have any questions about this questionnaire and activity, please contact, Mr. Habtamu Balderas, the READ TA project's Special Needs Advisor, through email or cell phone (hbalderas@read.rti.org or at 0921702241).

Do you have any questions?

Do you agree to participate in this effort?

Does the teacher consent?

School Information

RegionZone

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Tangerine

SchoolName

School information input

Please enter name of school if "other" selected

Please enter name of woreda if "other" selected

Section 1

1. What class section do you teach?

2. What is your sex?

Female Male

3. What is your age range?

under 20 years 20-24 years 25-29 years 30-34 years 35-39 years 40-44 years 45-49 years
 50-54 years 55-59 years 60-64 years 65-69 years above 69 years

4. How many students are in your class this year?

5. What is your educational training level?

High school Certificate Diploma Bachelor degree Master degree

6. What is your training level on Inclusive Education or Special Needs Education?

Untrained Attended 1 college common course Attended 2 college courses Certificate Diploma Bachelor Degree
 Master degree

7. How many years have you been teaching in Grades 1-4? (Please enter number of years)

8. How many students with disability do you have in your classroom? (Indicate a number)

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Tangerine

9. What type(s) of disabilities do they have? ((Select all that apply. Skip if no students have disabilities))

Vision impairments Hearing impairments Mental impairment Physical impairment Behavioural problems

10. How did you identify the children with these impairments? ((Skip if no children have disabilities))

11. Does your headteacher provide any specific support to you about inclusive education?

Yes No No response

12. Is there another teacher at your school with special training or experience in inclusive education/special needs education who provides support to you?

Yes No No response

13. Is there an itinerant teacher who regularly visits your school to provide support with special needs/inclusive education?

Yes No No response

Section 2 (Part 1)

2. I believe that the needs of students with moderate visual or hearing impairment can best be served through special, separate classes.

Strongly disagree Disagree Neutral Agree Strongly agree

4. I think that inclusion promotes more academic growth of students with moderate visual or hearing impairment.

Strongly disagree Disagree Neutral Agree Strongly agree

5. The extra attention that students with moderate visual or hearing impairment require will be to the detriment of the other students.

Strongly disagree Disagree Neutral Agree Strongly agree

6. I believe that inclusion of students with moderate visual or hearing impairment offers mixed group interaction which will foster understanding and acceptance of differences.

Strongly disagree Disagree Neutral Agree Strongly agree

8. I believe that I have sufficient expertise, knowledge, and skills to teach students with moderate visual or hearing impairment in my regular classroom.

Strongly disagree Disagree Neutral Agree Strongly agree

10. I believe that isolation in a special class has a negative effect on the social and emotional development of a student with a moderate visual or hearing impairment

Strongly disagree Disagree Neutral Agree Strongly agree

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Tangerine

11. I believe that a student with a moderate visual or hearing impairment will develop academic skills more rapidly in a special classroom than in a regular classroom.

Strongly disagree Disagree Neutral Agree Strongly agree

12. I can use a variety of assessment strategies (e.g. modified test, oral instead of written assessment, etc.) to evaluate students with moderate visual or hearing impairment.

Strongly disagree Disagree Neutral Agree Strongly agree

14. In my classroom, if a student with moderate visual or hearing impairment does not understand something that I explained, I will find another way to increase his/her understanding.

Strongly disagree Disagree Neutral Agree Strongly agree

15. I am sure that I have the ability and skills to motivate students with moderate visual or hearing impairment in my classroom.

Strongly disagree Disagree Neutral Agree Strongly agree

Section 2 (Part 2)

17. If students with disabilities are not disciplined, I cannot accept them in my classrooms.

Strongly disagree Disagree Neutral Agree Strongly agree

18. I can accurately gauge student comprehension of what I have taught.

Strongly disagree Disagree Neutral Agree Strongly agree

21. I feel comfortable designing learning tasks appropriate for children with visual or hearing impairments

Strongly disagree Disagree Neutral Agree Strongly agree

23. I believe that the inclusion of students with visual or hearing impairments can be beneficial for students without disabilities.

Strongly disagree Disagree Neutral Agree Strongly agree

25. I think that inclusion has negative effects on the emotional development of students with visual or hearing impairments.

Strongly disagree Disagree Neutral Agree Strongly agree

27. I believe that students with visual or hearing impairments are socially isolated by students without disabilities.

Strongly disagree Disagree Neutral Agree Strongly agree

Section 3

For each statement below, please rank your level of agreement or disagreement. Choose only one that most represents your level of judgement in the following problems or challenges that you face when implementing inclusive education.

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Tangerine

Strongly Disagree (D); Disagree; Neutral (N); Agree (A); Strongly Agree

1. Lack of training (is a problem or challenges that you face when implementing inclusive education)

Strongly disagree Disagree Neutral Agree Strongly agree

2. Shortage of teaching and learning materials for visual or hearing impairment

Strongly disagree Disagree Neutral Agree Strongly agree

3. Teacher attitudinal problems

Strongly disagree Disagree Neutral Agree Strongly agree

4. Large number of students in classes

Strongly disagree Disagree Neutral Agree Strongly agree

5. High teaching load for teachers

Strongly disagree Disagree Neutral Agree Strongly agree

6. Insufficient government support

Strongly disagree Disagree Neutral Agree Strongly agree

7. Poor working environment

Strongly disagree Disagree Neutral Agree Strongly agree

8. Severity of disability

Strongly disagree Disagree Neutral Agree Strongly agree

9. Lack of parental support

Strongly disagree Disagree Neutral Agree Strongly agree

10. Lack of support from school leadership in implementing the Ministry of Education inclusive education strategic document

Strongly disagree Disagree Neutral Agree Strongly agree

Respondent understands concept, but mentioned not knowing specific document

11. Lack of clarity on the Ministry of Education inclusive education strategic document

Strongly disagree Disagree Neutral Agree Strongly agree

Respondent understands concept, but mentioned not knowing specific document

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Tangerine

12. Lack of practical guidance in implementing the Ministry of Education inclusive education strategy

Strongly disagree Disagree Neutral Agree Strongly agree

Respondent understands concept, but mentioned not knowing specific document

15. Which disabilities are you most comfortable teaching in your classroom?

16. Which disabilities do you believe you cannot teach in your classroom?

17. How do you assess students with disabilities in your classroom?

19. How comfortable did you become in using the READ TA phone for screening children?

Very comfortable Somewhat comfortable Not very comfortable

20. How comfortable did you become in using the READ TA phone and IMLP for teaching the accommodated lesson plan?

Very comfortable Somewhat comfortable Not very comfortable

21. How could we improve the screening tool?

22. How could we improve the IMLP/accommodated lesson plans?

23. How could we improve the training you received for this initiative? ([remind them about the initial training, the two monitoring visits and the refresher training; which of these was most helpful; were they too long, too short; what training topics were most important, which were missing?])

24. If we were to do this initiative again with a new set of teachers, what else would you suggest we change? How can we make it better?

25. How has your thinking and practice about inclusive education and teaching children with impairments changed through this activity?

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Tangerine

26. How would you rate the effectiveness of this initiative to provide you with skills and instructional tools to better teach children with visual or hearing impairments reading in mother tongue? ([provide answer options])

Very effective Somewhat effective Somewhat ineffective Very ineffective

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Appendix B

Classroom Observation Instrument

Tangerine

Classroom Observation - English - Endline

Last Updated: 1495120231000

Enumerator Name

Date and time

Date

Time

Record Id

Record Id

School Information

RegionZone

SchoolName

School information input

Please enter name of school if "other" selected

Please enter name of woreda if "other" selected

Header Information

E. Teacher name:

F. Grade:

G. Class section:

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H. School Shift:

Full day Morning Afternoon

I. Total number of children present ((Count the children in the classroom))

J. Total number of girls present ((How many of the children that are present in the class are girls))

K. Total number of MT reading books present during lesson ((Count the number of mother tongue student books present during lesson))

Child Information

How many children will you observe today?

1 2 3 4

Child 1 ID

Enter Child 1 VI level

Normal Mild Moderate Severe Blind

Enter Child 1 HI level

Normal Slight Mild Moderate Moderate-severe Severe

Child 2 ID

Enter Child 2 VI level

Normal Mild Moderate Severe Blind

Enter Child 2 HI level

Normal Slight Mild Moderate Moderate-severe Severe

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Child 3 ID

Enter Child 3 VI level

Normal Mild Moderate Severe Blind

Enter Child 3 HI level

Normal Slight Mild Moderate Moderate-severe Severe

Child 4 ID

Enter Child 4 VI level

Normal Mild Moderate Severe Blind

Enter Child 4 HI level

Normal Slight Mild Moderate Moderate-severe Severe

Student Observation

1. Is the student seated at the front of the room?

Child 1 (Yes) Child 2 (Yes) Child 3 (Yes) Child 4 (Yes) Child 1 (No) Child 2 (No) Child 3 (No)
 Child 4 (No)

2. Is the student seated where lighting is best?

Child 1 (Yes) Child 2 (Yes) Child 3 (Yes) Child 4 (Yes) Child 1 (No) Child 2 (No) Child 3 (No)
 Child 4 (No)

3. During group work, is the student seated in a circle with peers to facilitate communication

Child 1 (Yes) Child 2 (Yes) Child 3 (Yes) Child 4 (Yes) Child 1 (No) Child 2 (No) Child 3 (No)
 Child 4 (No) No group work observed during lesson

4. Are questions repeated or rephrased as needed for this student?

Child 1 (Yes) Child 2 (Yes) Child 3 (Yes) Child 4 (Yes) Child 1 (No) Child 2 (No) Child 3 (No)
 Child 4 (No)

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5. Is extra time given to this student to respond to questions?

- Child 1 (Yes) Child 2 (Yes) Child 3 (Yes) Child 4 (Yes) Child 1 (No) Child 2 (No) Child 3 (No)
 Child 4 (No)

6. Is the student permitted to respond verbally if VI or in writing or sign language if HI (note any other response methods used by the student)?

- Child 1 (Yes) Child 2 (Yes) Child 3 (Yes) Child 4 (Yes) Child 1 (No) Child 2 (No) Child 3 (No)
 Child 4 (No)

6a. Other methods

7. How is the student's engagement in class?

- Child 1 On-task behavior – focused on the teacher, the class, or on the work assigned
 Child 1 Off-task behavior – Not focused on the teacher or what the class or group is doing.
 Child 1 Disruptive - speaking out of turn, not sitting, making noise, fighting or talking with other children etc.
 Child 2 On-task behavior – focused on the teacher, the class, or on the work assigned
 Child 2 Off-task behavior – Not focused on the teacher or what the class or group is doing.
 Child 2 Disruptive - speaking out of turn, not sitting, making noise, fighting or talking with other children etc.
 Child 3 On-task behavior – focused on the teacher, the class, or on the work assigned
 Child 3 Off-task behavior – Not focused on the teacher or what the class or group is doing.
 Child 3 Disruptive - speaking out of turn, not sitting, making noise, fighting or talking with other children etc.
 Child 4 On-task behavior – focused on the teacher, the class, or on the work assigned
 Child 4 Off-task behavior – Not focused on the teacher or what the class or group is doing.
 Child 4 Disruptive - speaking out of turn, not sitting, making noise, fighting or talking with other children etc.

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8. How is the student's interaction with peers?

Child 1 Interacting positively – talks appropriately with classmates, engages in group discussions, takes turns, plays appropriately with peers outside etc.

Child 1 Interacting negatively –speaks inappropriately, disrupts group work, is aggressive (hits, kicks, insults, etc.),

Child 1 No interaction – sits alone

Child 2 Interacting positively – talks appropriately with classmates, engages in group discussions, takes turns, plays appropriately with peers outside etc.

Child 2 Interacting negatively –speaks inappropriately, disrupts group work, is aggressive (hits, kicks, insults, etc.),

Child 2 No interaction – sits alone

Child 3 Interacting positively – talks appropriately with classmates, engages in group discussions, takes turns, plays appropriately with peers outside etc.

Child 3 Interacting negatively –speaks inappropriately, disrupts group work, is aggressive (hits, kicks, insults, etc.),

Child 3 No interaction – sits alone

Child 4 Interacting positively – talks appropriately with classmates, engages in group discussions, takes turns, plays appropriately with peers outside etc.

Child 4 Interacting negatively –speaks inappropriately, disrupts group work, is aggressive (hits, kicks, insults, etc.),

Child 4 No interaction – sits alone

9. Did any of the observed students provide an individual response during the class? ((response to a question by the teacher, e.g.))

None of the students in the class provided an individual response

No, the observed students never provided an individual response (but other students did)

Yes, one of the observed students provided an individual response

Yes, several of the observed students provided an individual response

10. Did any of the observed students ask the teacher a question during the class?

None of the students in the class asked the teacher a question

No, the observed students never ask a question (but other students did)

Yes, one of the observed students ask a question

Yes, several of the observed students asked a question

Teacher Observation

At the end of the observation, respond to the following questions noting whether teachers carried out these activities and, if so, how frequently they did so during the lesson.

1. Teacher ensures that student are paying attention before beginning an activity or asking a question

Never

Rarely

Some times

Frequently

All the time

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2. Teacher speaks clearly and loudly enough to be heard in the back of the class

Never Rarely Some times Frequently All the time

3. Teacher speaks facing the class and his or her mouth is not obstructed

Never Rarely Some times Frequently All the time

4. Teacher writes questions on the board

Never Rarely Some times Frequently All the time

5. Teacher writes lesson objective on the board

Never Rarely Some times Frequently All the time

6. Teacher repeats questions at least once to ensure that VI or HI students have understood the question

Never Rarely Some times Frequently All the time

7. How often did the teacher repeat her or his responses to ensure that the VI or HI students have understood the response?

Never Rarely Some times Frequently All the time

8. How often did the teacher repeat the questions or responses of other students to ensure that the VI or HI students have understood the response?

Never Rarely Some times Frequently All the time

9. How often did the teacher orally describe pictures or illustrations used for the lesson?

Never Rarely Some times Frequently All the time Not applicable for the lesson

10. Did the teacher use a self-made teaching aid to support her instruction?

Yes No

10a. If yes, was this material specifically in support of a child/children with disabilities?

Yes No

10b. If yes, specify what material was used:

11. Did the class use the new student textbooks for reading and writing in Mother Tongue?

Yes No

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12.a. Did the teacher use the inclusive multimedia teacher guide on the smartphone for teaching the lessons?

Yes No

12.b. Did the teacher use the new teacher guide for reading and writing in Mother Tongue? ((either in addition to the smartphone or by itself (if the teacher did not use the smartphone))

Yes No

12.c. How confident was the teacher in using the IMLP on the smartphone?

Very confident Somewhat confident Not at all confident

13.a. Did the teacher play back any of the audio files from the smartphone for the class or some of the students?

Yes No

13.b. How confident was the teacher in playing back any of the audio files from the smartphone for the class or some of the students?

Very confident Somewhat confident Not at all confident

14.a. Did the teacher give the smartphone to a student or groups of students to listen to or access text?

Yes No

14.b. How confident was the teacher in giving the smartphone to a student or groups of students to listen to or access text?

Very confident Somewhat confident Not at all confident

14.c. If yes, did the phone distract the other students or cause disruption?

Yes, it distracted the students a lot Yes, it distracted the students a little bit No, it did not distract the students

15. Did the teacher press the 'Lesson Completed' button at the end of the lesson?

Yes No Don't know

Appendix C

Student Questionnaire

Tangerine

Student Egra & Questionnaire - English - Endline

Last Updated: 1495120811000

Enumerator Name

Date and Time

Date

Time

Student ID Input

DO NOT press the 'Generate' button below. Enter the learner's code from the list of pre-generated IDs.

BE SURE TO USE ALL CAPS.

If you have pressed 'Generate' by mistake, please delete what appears in the box and then ENTER in the appropriate student code from the list of pre-generated IDs

Student ID Input

Student ID confirmation

Please re-enter the pre-generated student ID

Consent

Good morning. My name is _____ and I live in _____. I'd like to tell you a little bit about myself.

(Number and ages of children; pets; sports; etc)

- 1. Could you tell me a little about yourself and your family?** (Wait for response; if student is reluctant, ask question 2, but if they seem comfortable continue to verbal consent).
- 2. What do you like to do when you are not in school?**

Let me tell you why I am here today. I work with the Ministry of Education and we are trying to understand how children that may have difficulty seeing or hearing learn to read. We would like your help in this.

Today, we are going to play a reading game. I am going to ask you to read letters, words and a short story out loud. This is NOT a test and it will not affect your grade at school.

I will also ask you if you have difficulty seeing or hearing, and a few questions about your classroom.

I will NOT write down your name so no one will know these are your answers.

Our talk today will take about 20 minutes to complete.

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Once again, you do not have to participate if you do not wish to. Once we begin, if you would rather not answer a question, that's all right.

Do you have any questions? Are you ready to get started?

Does student provide consent?

School Information

RegionZone

SchoolName

School information input

Please enter name of school if "other" selected

Please enter name of woreda if "other" selected

Header Information

F. School Shift

Full day Morning Afternoon

I. Teacher Name

J. Grade

K. Class Section

M. Student Age

6 7 8 9 10 11 12 13 14 15 16 Don't Know

N. Student gender

Boy Girl

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O. Screened positive for Vision Impairment

Yes No Don't know

P. Screened positive for Hearing Impairment

Yes No Don't know

Section 1: Letter Sounds

Here is a page full of letters of the English alphabet. Please tell me the SOUNDS of as many letters as you can—not the NAMES of the letters, but the sounds.

For example, the sound of this letter [point to V]: “AH” as in “APPLE”

Let’s practice: tell me the sound of this letter [point to V]:

If the child responds correctly say: **Good, the sound of this letter is “VVV.”**

If the child does not respond correctly, say: **The sound of this letter is “VVVV.”**

Now try another one: tell me the sound of this letter [point to L]:

If the child responds correctly say: **Good, the sound of this letter is “LLL.”**

If the child does not respond correctly, say: **The sound of this letter is “LLL.”**

Do you understand what you are to do?

When I say “Begin,” please sound out the letters as quickly and carefully as you can. Tell me the sound of the letters, starting here and continuing this way. [Point to the first letter on the row after the example and draw your finger across the first line]. If you come to a letter sound you do not know, I will tell it to you. If not, I will keep quiet and listen to you. Ready? Begin.

A	I	J	N	S	n	A	t	e	h
l	z	a	V	B	o	h	r	N	T
a	C	f	C	S	a	s	O	E	U
e	N	t	o	a	e	x	t	o	q
d	L	E	d	G	E	N	o	m	O
h	e	K	w	T	i	L	g	y	H
e	i	r	y	H	l	s	e	T	f
R	y	W	p	U	s	i	l	e	l
R	o	a	E	d	n	D	a	s	l
r	C	n	U	r	T	P	t	m	h

Time Remaining

Autostop?

Section 2a. Oral passage reading

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My	name	is	Pat.	I
live	on	a	farm	with
my	mother,	father,	and	brother
Sam.	Every	year,	the	land
gets	very	dry	before	the
rains	come.	We	watch	the
sky	and	wait.	One	afternoon
as	I	sat	outside,	I
saw	dark	clouds.	Then	something
hit	my	head,	lightly	at
first	and	then	harder.	I
jumped	up	and	ran	towards
the	house.	The	rains	had
come	at	last.		

Time Remaining

Autostop?

Section 2b. Oral passage reading

Now I am going to ask you a few questions about the story you just read. Try to answer the questions as well as you can.

1. Where does Pat live?

Correct Incorrect No response

2. Why does the land get dry?

Correct Incorrect No response

3. Why do Pat and his family watch the sky?

Correct Incorrect No response

4. What hit pat on the head?

Correct Incorrect No response

5. How do you think Pat felt when the rains come?

Correct Incorrect No response

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Section 3. Pupil context interview. 1st part.

17. Were you absent from school any days last week?

No Yes Do not know/No response

18. [if yes to Question 17] Why were you absent?

I was not absent I was sick There was other work at home I had to take care of a family member
 I had no transport, or my transport was late Bad weather Getting to school was too dangerous Being in school is too dangerous
 I woke up late I had to take care of siblings I am treated poorly by teachers and other students at school Other (specify)
 Don't know/Refuse

18.a. Other (Specify)

19. Do you have this reading textbook for use at home and classroom? ([enumerator shows color print of cover page of grade 2 student reading textbook])

No Yes Do not know/No response

20. [if yes to Question 19] Did you bring it today?

No Yes Don't know/No Response

28. Now I am going to ask you about your vision and hearing. When the teacher writes something on the board, do you have any difficulty seeing what s/he writes?

No Yes Do not know/No response

29. When you look at the textbook do you have any difficulty seeing the letters?

No Yes Do not know/No response

30. When the teacher is speaking do you have any difficulty hearing her or him?

No Yes Do not know/ No response

31. When a classmate responds to the teacher's question, do you have difficulty hearing their answer?

No Yes Do not know/ No response

32. Now I am going to ask you about your class and your classmates. Do some of your classmates have a disability?

No Yes Do not know/No response

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33. Do you have friends who have disabilities?

No Yes Do not know/ No response

34. Last week, how often did your teacher use a phone during the reading and writing lesson?

Every lesson Sometimes Never

35. Last week, did your teaching play back any stories or words from the phone during reading class?

Yes No Don't know

Section 3. Pupil context interview. 2nd part.

36. Do you like school?

No Yes Do not know/ No response

38. Does your teacher make sure that you can see and hear what the teacher and other students say and do?

No Yes Do not know/No response

39. If you can't see or hear something, can you ask your teacher to repeat it or write it down for you?

No Yes Do not know/No response

41. Last week, during any of your reading lessons, did your teacher ever call on you individually to answer a question?

No Yes Do not know/No response

44. Do you have any special materials to help you in class, such as reading books printed with large letters or devices to help you see or hear better? (skip if no hearing or visual impairment)

Yes No

44a. If yes, what?

Appendix D

Baseline Assessment Protocol

**READ TA Assistive Technology Initiative
Baseline Assessment Protocol
December 2016**

I. Purpose of the Assessment Protocol

Guide the data collection for the assistive technology initiative baseline in schools to ensure the appropriate sequence is followed, and in the same way across schools and regions.

II. Purpose of the Assessment

Test assumptions about the experience that students with visual impairment (VI) and students with hearing impairment (HI) may have in mother tongue classrooms; and the experience their teachers have teaching them.

III. Scope of the Assessment

- 110 classrooms in 55 schools in 5 regions
- Two days of data collection in each school (first day: screenings, classroom observations – ca. 4.5 hours); second day: teacher interview, student interviews, principal interview, teacher focus group – about four hours)

IV. Assumptions for the Assessment

- Schools and classrooms have already been identified
- School list and classroom enrollment lists have already been received by the READ TA project team and the Classroom Assessment Summary been filled out for each classroom, assigning a Tangerine/Child identification number (ID) for each child
- Classrooms already have section identifiers assigned by the school (a, b, c, etc.)
- School location lists have already been uploaded on Tangerine on the Nexus tablet
- There are supposed to be two participating Grade 2 classrooms in each school
- Classrooms are distinguished by section name (a, b, c, etc.), which needs to be included in all Tangerine instruments on the Nexus
- On average, classrooms may have 30-50 students
- Assessor teams contain at minimum three personnel, indicatively made up of one READ TA staff (acting as team leader), one Tangerine experienced data collector, and one assistive technology initiative working group member
- Each team has two headsets and two phones for the screening activity, one per classroom
- Each team has, in addition, three tablets for the classroom observation; teacher, student and principal questionnaire; and teacher group discussion
- Students are to be screened in privacy – ideally a separate room. There should be at least 4 meters of space around the assessor and the child to facilitate optimal screening conditions. The teacher is not to be present during the screening or interview
- The room for the student screening should be normally lit; too bright or too dark spaces should be avoided
- Student screenings and interviews should take place in the morning shift
- Student, teacher and principal interviews are also to be conducted with privacy
- Screenings per child take about two minutes, not including transition times between children

- Student interviews take about 15 minutes, not including transition times between children
- Classroom observations will take the entire duration (40 minutes) of a class
- Classroom observations will only be conducted for classrooms teaching reading and writing in Mother Tongue
- Teacher and principal interviews take about 20-30 minutes each
- Each team has at least 20 referral slips for each child identified to have VI/HI. The referral slip will notify the parent that the child had been screened and that based on this screening may have a VI/HI. The parent is encouraged to follow up by taking the child to a health clinic for professional diagnosis. The address of the nearest health clinic providing vision and hearing diagnostics for children will be provided to parents.

V. Sequence of Activities at Each School

1. Introduction and welcome with principal
2. Enrollment list review for both classrooms with teachers compared to Classroom Assessment Summary. Assessor adds for each child the existing VI/HI assumptions by teacher for each child.
3. Screening of all children in each classroom conducted by assessors, not by teacher
4. Classroom observation for each classroom by all three assessors
5. Student interview conducted by two assessors – each being responsible for a different classroom
6. Teacher interview and principal interview conducted by third assessor
7. Thank you and leave

5.1 Introduction and welcome

- Assessor team seeks out principal of school upon arrival
- Team introduces themselves, purpose of activity, confirm that principal was informed of team's visit
- Confirm that at least two Grade 2 classrooms
- Confirm that at school all Grade 2 students have received the new Grade 2 student book for reading and writing in mother tongue
- Confirm that teachers for whom student classroom rolls have been shared, are present and will be teaching reading and writing in mother tongue that day
- Identify two locations for screenings offering sufficient privacy, appropriate noise level and lighting

5.2 Review enrollment list

- For each of the two selected classrooms, one assessor sits with the teacher and reviews the enrollment list on the Classroom Assessment Summary
- For each child on the list, assessor asks teacher if child has a known VI or HI and records the respective response with the child's name on the appropriate field in the Classroom Assessment Summary sheet
- Children not in the school anymore or present that day, are stroked out of the School Assessment Summary sheet
- Assessor does not (yet) talk in detail with teacher to avoid share too much about the activity with the teacher at that point in time

5.3 Screening of all children in both classrooms

- All children present in each selected classroom are to be screened for VI and HI. One assessor will be responsible for one classroom each. The third assessor will support logistics of student transfer between assessments as needed.
- Student first on Classroom Assessment Summary sheet starts, and is asked to come up for screening
- Assessor has screening app on Tecno phone already open and is prepared to enter student information
- Consent statement is read to student. Screening is only continued if student gives consent. If student does not give consent, thank student and send back to class.
- If student gives consent, assessor will enter the first three letters of the student's first name and the first three letters from Classroom Assessment Summary into the required fields on the phone. Assessor does not ask for birth date but records the child's gender. Assessor also transcribes the student's ID number from the Classroom Assessment Summary to the medical record number field into the screening app on the TECNO phone. Finally, the assessor adds for each child whether the teacher had indicated that the child has a known VI or HI; then the assessor will conduct the screening.
- To screen the child, the assessor follows the instructions on the screen, confirming that consent was provided, and completing both, the HearScreen and the PeekVision tests
- When finished, assessor thanks the child and sends it back to the classroom
- Depending on results, assessor marks the child's screening as completed and indicates if identified for VI/HI on the Classroom Assessment Summary for the school
- Assessor asks the next child on the Classroom Assessment Summary to come up for the screening and continues so for the whole classroom present
- After screening, assessment team does a quick meet to confirm that each of the two classrooms has at least three children identified with VI/HI
- If a classroom does not have that number, and the school has another classroom, that other classroom is selected as a substitute and students are screened. If found that the substitute classroom has at least three children with VI/HI, all remaining activities are to be conducted in this classroom, but each student will have to be newly entered from the enrollment list onto a new Classroom Assessment Summary (unused ID numbers from the previous classrooms are to be copied over to the new Classroom Assessment Summary).
- It is estimated that screening of one classroom with 50 children may take three hours. Both classrooms should be screening in parallel.
- Assessors will not share any results of the screening with the teacher until after the classroom observations have been completed (this will help to ensure that we have a true measure of the teachers' typical classroom and accommodation practices)
- After the screening has been completed for each classroom, the assessor team supervisor marks the completion of the classroom observation on the School Overview.

5.4 Classroom observation

- Only classes on reading and writing in Mother Tongue using the new teacher guide and student books are observed
- Assessors decide who focuses on which child for the classroom observation. Each assessor will focus on one or two children identified with VI/HI (depending on how many have been identified in this classroom).

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- Consent for classroom observation and subsequent teacher interview and group discussion is sought from teacher in writing before observation starts
- If consent is not given, thank teacher and replace classroom
- For recording data from the classroom observation, assessors use the Tangerine app on the Nexus tablet
- Assessors make sure to correctly enter the ID number of the children with VI/HI they are responsible for into the relevant fields in the Tangerine Classroom Observation instrument. Assessors do not enter the name of the child (keeping the student name out of the actual questionnaire and out of the database will help to ensure that the resulting analysis will remain anonymous).
- Assessors make sure to correctly enter the section identifier for the class section they observe
- Assessors observe the entire lesson of one classroom, all along entering observations into the Tangerine Classroom Observation instrument.
- When one classroom has been completed, assessor team observes the entire lesson of the other classroom.
- It is estimated that both classroom observations may take 1.5 hours together, with one being conducted right after the other.
- After each classroom observation has been completed, the assessor team supervisor marks the completion of the classroom observation on the School Overview

5.5 Student interview

- Following the classroom observation, all children identified with VI/HI are being asked to participate in the student interview
- An equal number of children in each classroom, without VI/HI, are also being asked to participate in the student interview. These children should be selected randomly from the remainder of the class.
- To do this, assessors count the total number of children present from the student roll, then divide that number by the number of kids identified with VI/HI; e.g., $32/4 = 8$. Starting at a random child on the list, the assessor counts out every 8th child, and proposes this child for interview
- For the Student Interview instrument, assessors use the interview instrument in the correct Mother Tongue language from the Tangerine app on the Nexus tablet.
- Assessors make sure to correctly enter the ID number of the children to be assessed into the Student Interview instrument on Tangerine. Assessors do not enter the name of the child (keeping the student name out of the actual questionnaire and out of the database will help to ensure that the resulting analysis will remain anonymous).
- Assessors make sure to correctly enter the section identifier for the class section the child belongs to
- Consent by the child is again sought for this activity
- If child does not want to participate, assessor thanks the child and asks for next
- If child consents, assessor will conduct student interview
- Once the interview with a child has been completed, assessor thanks the child, marks the child's interview completed on the Classroom Assessment Summary, and asks for the next child
- It is estimated that per classroom, this may take 2 hours

- After completing all student interviews for each classroom, the assessor team supervisor marks the student interviews as completed on the School Overview

5.6 Teacher and principal interviews

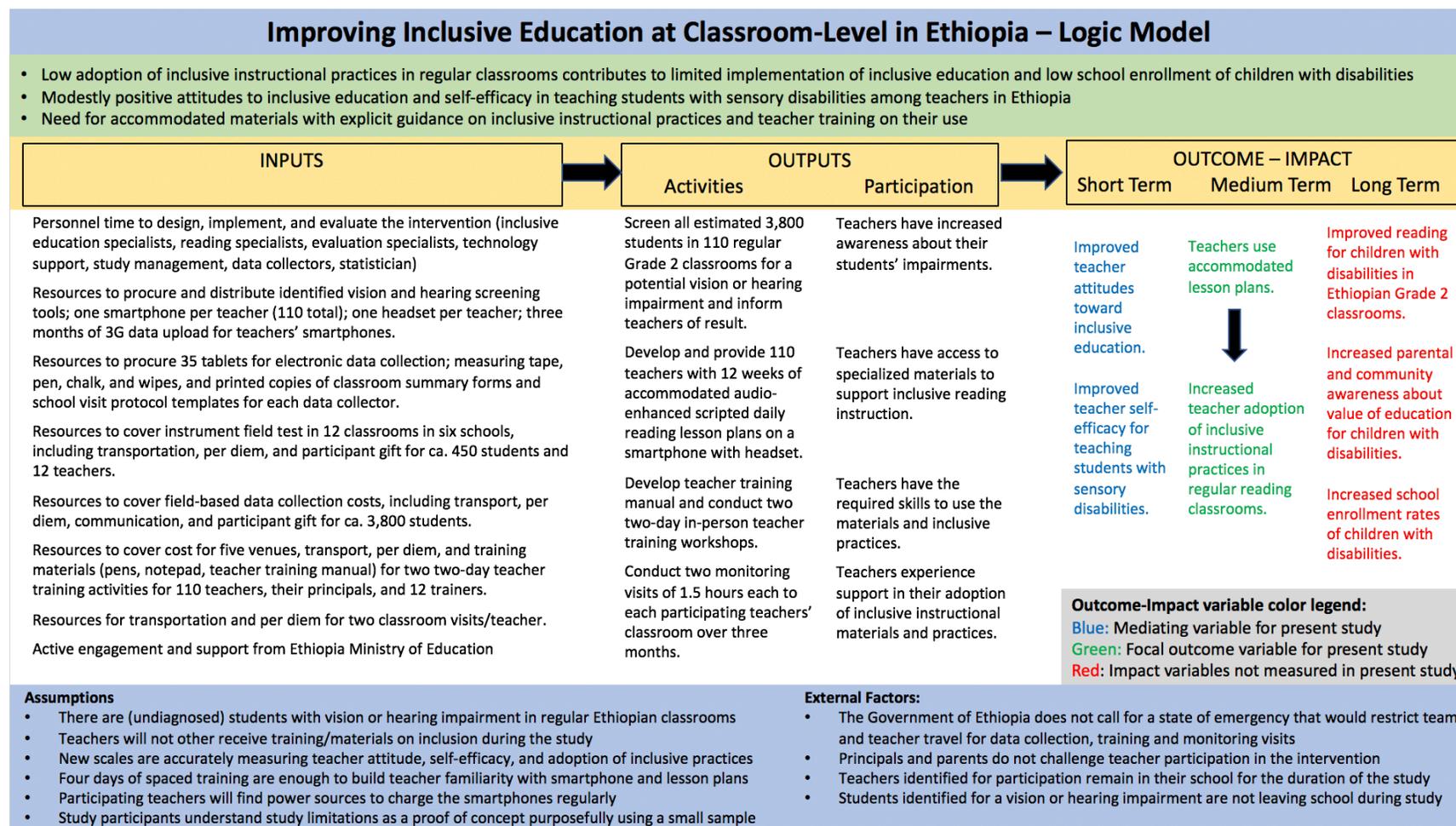
- Once student screenings, classroom observations, and student interviews have been completed, assessors conduct an interview with the teacher of their classroom.
- Assessors use the Tangerine app on the Nexus tablet
- Assessors use the Teacher Interview instrument and records teachers' responses
- Assessors makes sure to correctly enter the section identifier for the class section the teacher teachers
- Once the interview with the teacher has been completed, assessor thanks the teacher and the assessor team supervisor mark the teacher interview completed on the School Overview
- Both teachers are interviewed in parallel, following the classroom observations by the assessors who were conducting the screening in their classroom
- The third assessor conducts the principal interview, using the Principal Interview instrument in the Tangerine app on the Nexus tablet to record principal's responses.
- Once the interview with the principal has been completed, assessor thanks the principal and the assessor team supervisor mark the principal interview completed on the School Overview

VI. Thank you and leave

- Once all screenings, classroom observations, student interviews, teacher interviews, principal interviews and focus groups have been completed, assessor double check the Classroom Assessment Summary and School Overview against the completed screenings and assessments one more time on their phones and tablets to confirm.
- Most importantly, the ID numbers of each child need to with their results in the screening app on the Tecno phone, with the classroom observation of the assessor responsible to observe that child, and on the student interview for that same child.
- The classroom section identifier needs to be in the screening app on the Tecno phone, with the classroom observation, on the student interview, and on the teacher interview.
- Assessor teams will then fill out a referral slip for each child identified to have VI/HI. The referral slip will notify the parent that the child had been screened and that, based on this screening, it has been identified to possibly have a VI/HI. The parent is encouraged to follow up by taking the child to a health clinic for professional diagnosis. The address of the nearest health clinic providing vision and hearing diagnostics for children will be provided to parents on the referral slip.
- Assessors will hand slips over to teacher, to send home with each identified child. The principal is encouraged to reach out in person (or via teacher) where it is known that parents may not be able to read the slip.
- Thank everybody and leave

Appendix E

Logic Model



Appendix F

Summary Matrix of Research Questions, Variables and Data Analysis

Research Question	Variables	Instrumentation	Data	Data Analysis
How do teachers use the accommodated instructional materials to support adoption of inclusive instructional practices?	<p>Teachers' level of usage of the smartphones and inclusive multimedia lesson plans.</p> <p>Teacher level of confidence in use of inclusive multimedia lesson plans.</p> <p>Teacher level of confidence in use of audio files embedded in inclusive multimedia lesson plans.</p>	<p>Site visit monitoring protocol.</p> <p>Classroom observation instrument.</p>	<p>Questions about teachers' usage of the inclusive multimedia lesson plan on smartphone and audio elements included in a larger site visit monitoring protocol, classroom observation instrument, and teacher interview instrument.</p>	<p>Descriptive analysis of responses on target questions.</p> <p>Qualitative analysis of responses to open questions. Code/word frequency to establish major themes.</p>
To what degree does participation in the intervention improve teachers' attitude to inclusive education and their self-efficacy in teaching students with sensory disabilities?	<p>Teacher attitude toward inclusive education.</p> <p>Teacher self-efficacy for teaching students with sensory disabilities.</p>	<p>Teacher attitude to inclusive education scale (newly developed).</p> <p>Teacher self-efficacy in teaching students with sensory disabilities scale (newly developed).</p>	<p>For both, the teacher attitude and teacher self-efficacy scale, 5-point Likert scale statements with answer options <i>strongly disagree</i> (1), <i>disagree</i> (2), <i>neutral</i> (3), <i>agree</i> (4), and <i>strongly agree</i> (5) were read out to teachers as part of a larger teacher interview instrument.</p>	<p>Calculation of mean scores from teachers' responses on each scale.</p> <p>Linear regressions to establish whether differences in mean scores between baseline and endline are statistically significant for each scale.</p>

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<p>To what degree does participation in the intervention improve teachers' adoption of inclusive instructional practices in regular reading classrooms?</p>	<p>Teacher adoption of inclusive instructional practices in regular reading classrooms</p>	<p>Classroom observation instrument</p>	<p>To measure teacher adoption of inclusive instructional practices, a frequency scale with observational items with answer options <i>never</i> (0), <i>rarely</i> (1), <i>sometimes</i> (2), <i>frequently</i> (3), or <i>all the time</i> (4) was included in a structured classroom observation protocol.</p>	<p>Descriptive analysis, notably frequencies of observers' responses on each item of the instructional practices scale in the classroom observation protocol.</p>
		<p>Student interview</p>	<p>Questions about teacher's usage of the inclusive multimedia lesson plan on smartphone and audio elements included in a larger student interview instrument.</p>	<p>Simple comparison of frequencies for <i>frequently</i> and <i>all the time</i> of from the instructional practices scale between baseline and endline. Descriptive analysis of students' responses on target questions.</p>

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Appendix G

Teacher Training Manual



Ministry of Education

Assistive Technology Capacity Building Initiative: Teacher Training Manual Reading for Ethiopia's Achievement Developed Technical Assistance (READ TA)



IMPROVING INCLUSIVE INSTRUCTION IN ETHIOPIA

**Reading for Ethiopia's Achievement Developed
Technical Assistance (READ TA)
Cooperative Agreement No.: AID-663-A-12-00013**

**Assistive Technology Capacity Building Initiative: Teacher Training Manual
Reading for Ethiopia's Achievement Developed Technical Assistance (READ TA)**

Ethiopia May 2017

DISCLAIMER

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The READ TA project

Initiated in October 2012, the Reading for Ethiopia’s Achievement Developed Technical Assistance (READ TA) project is a five-year initiative to improve the reading and writing performance of 15 million primary grade students in seven Ethiopian languages (Afaan Oromo, Af-Somali, Amharic, Hadiyyisa, Sidaamu Afoo, Tigrinya, and Wolayttatto), in addition to English as a second language. The READ TA project is implemented by RTI International and its partners: Save the Children, Florida State University, Inveneo, Books for Africa, and WhizKids Workshop.

Background

READ TA has supported the Ethiopian Ministry of Education to develop early grade reading curricula and curriculum materials in seven mother tongues (MTs): Afaan Oromo, Af-Somali, Amharic, Hadiyyisa, Sidaamu Afoo, Tigrinya, and Wolayttatto. Teachers who are responsible for teaching early grade children how to read and write in their MT were trained on how to teach the new MT curriculum and use the new MT curriculum materials.

Ethiopian schools at all levels have also sought to broaden their mission to address the diverse educational needs of children. During the last few decades, the Ethiopian government has started a massive expansion of the education system. However, increases in access to education for children with special needs did not occur rapidly. Many factors have contributed to why education for students with special needs has lagged in terms of meeting students’ diverse needs, including gaps in teacher training, a lack of modified/adapted learning materials, and a lack of access to tools and technology to facilitate identification and learning. The assistive technology (AT) initiative of READ TA is one attempt to meet the diverse needs of students with special needs. This initiative will function as a proof of concept to explore whether the provision of technology-mediated pedagogical support materials and training will promote the adoption of inclusive instructional practices and help to remove the barriers of teacher attitude and efficacy in teaching children who are hard of hearing (HoH) or who have low vision (LV).

To this end, READ TA has established regional AT working groups in the five regions and conducted a regional rapid data collection activity to gain initial insight into the situation of children with special education needs and the support available to them. Data collected from the five regions by working group members were used to inform the selection of modest appropriate ATs specific to each of the five regions. The regional AT working groups collaborated to jointly assess needs and agree on technology that can be implemented in each region, resulting in the design of the READ TA Assistive Technology Capacity Building Initiative (ATCBI).

The ATCBI teacher training will encourage the effective use of AT. Some educators may not yet be aware of the types of AT available and how this technology can be used with their students. Part of this training should include instruction on setting up and using the device, working with the modifications to the device, learning to troubleshoot problems, and making use of the device to meet the student’s educational goals. Hands-on activities are an essential element of this training.

Using the manual as a trainer

This manual was created for the training of Grade 2 MT teachers on the ATCBI through a materials-based training workshop. Hence, this manual must be used alongside the revised MT materials,

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which contain activities for teaching basic literacy skills. Participants in this workshop will need to make frequent reference to the electronic accommodated teacher’s guide for Android smartphone devices, which will be referred to as the Inclusive Multimedia Lesson Plan (IMLP). The IMLP will be used by the teachers in many activities during this training.

This manual explains how to accommodate students with LV and students who are HoH while incorporating AT in the inclusive classroom. Next, it demonstrates how to use the IMLP. Notice that the manual outlines a daily training schedule for the course of the workshop and structures the training by the number of days of the workshop. Key sessions will have objectives that the trainers are expected to focus on.

This manual contains content for a three-day AT and inclusive education teacher training. Before the training, ensure that you read and become familiar with all parts of the manual. Make sure you have practiced using the phones and teaching the lesson that you will model via the IMLP ahead of time and are comfortable facilitating using the necessary materials. If there are questions concerning any part of the manual, be sure to ask one of the workshop facilitators prior to training.

Materials Needed
Flip Chart
Markers
Pencils and pens
Paper
Phones
Headsets
Teacher’s guide (hardcopy)

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Acronyms/Abbreviations

AT	assistive technology
ATCBI	Assistive Technology Capacity Building Initiative
HI	hearing impairment
HoH	hard of hearing
IMLP	Inclusive Multimedia Lesson Plan
LV	low vision
MT	mother tongue
READ TA	Reading for Ethiopia's Achievement Developed Technical Assistance
VI	vision impairment

Introductory Section (30 minutes)

Welcome the participants and introduce yourself. Tell the participants that this is going to be a three-day training for Grade 2 teachers who have students with low vision (LV) or students who are hard of hearing (HoH) in their classroom. Ask each participant to stand and say their name, school, how long they have been a mother tongue (MT) teacher, and their goals for the training. Write the stated goals and expectations on a flip chart and post the information in the room for all to see during the training. After all participants have completed the introduction, ask them to raise their hand if they have ever taught reading to a child with LV or who is HoH. If there are hands raised, select a few participants and ask them to share their experience. After participants have finished sharing, read the objectives of the training to them and ask if there are any questions.

Dear Trainer:

Please display the objectives on a flip chart. Read the objectives to the participants and place the objectives in a location where all can see and refer to them throughout the session.

Training Objectives

Major objectives of the training:

- Provide teachers with the necessary skills and practice to use the phone-based Inclusive Multimedia Lesson Plan (IMLP) and the vision impairment (VI)/hearing impairment (HI) screening tool.
- Increase participants' awareness of children with disabilities and the barriers associated with LV or partial hearing.
- Provide teachers with essential pedagogical approaches to meet the needs of students with LV or students who are HoH.

Introduction to Inclusive Education (45 minutes)

By the end of this session, participants should be able to:

- Provide the definition of inclusive education
- Differentiate between exclusion, segregation, integration, and inclusive education
- Explain the importance and benefits of inclusive education through curriculum differentiation

The setting of the Assistive Technology Capacity Building Initiative (ATCBI) is in inclusive classrooms in regular schools. Therefore, it is important that teachers understand what inclusive education means and how it compares to other forms of education for students with disabilities.

? Warm-up Exercise

Trainer, ask participants the following questions. Allow five minutes for responses.

- What comes to your mind when you hear the term 'inclusive education'?
- How does inclusive education differ from integrated education?

Following their responses, provide participants with the information below:

Exclusion, Segregation, Integration, and Inclusion

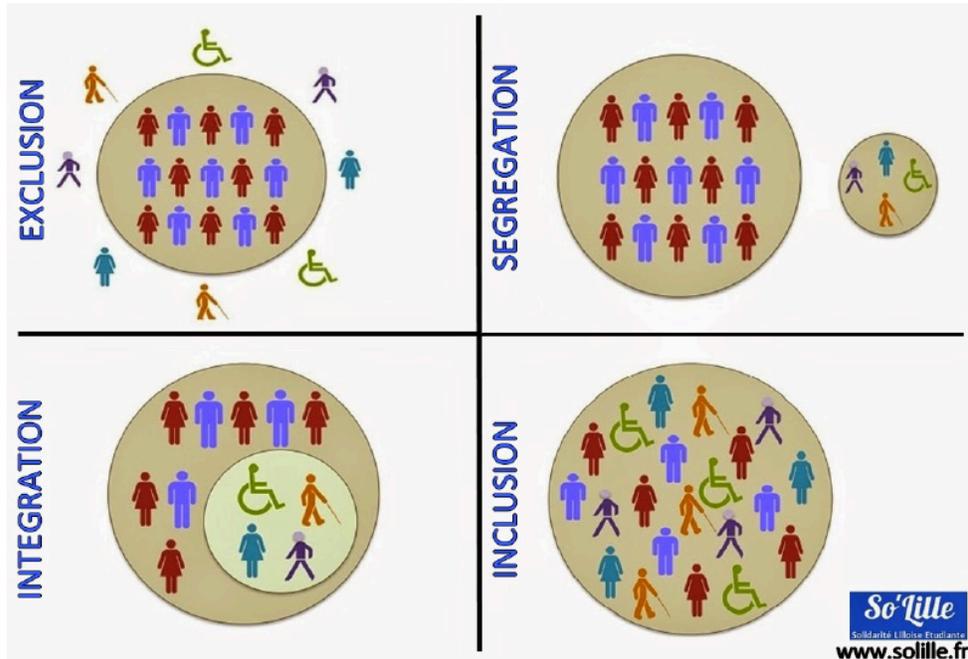
- Exclusion** means that a student is not allowed to attend school or go onto school premises for a period of time or permanently. A student who does not receive instruction in any school is said to be excluded.
- Segregation** is the separation of students with special needs from the general population. These students are placed in special education classrooms or separate schools for that specific disability.
- Integrated** education places students with needs in the general education class with little or no adaptation or attention to the needs of the student with the disability.
- Inclusive** education places students with special needs in general classrooms with adaptations and accommodations in place to overcome barriers and meet the needs of all students. It is a means to create a culture where **all** learners feel welcome, accepted, safe, valued, and confident that they will get the right support to assist them to develop their talent and achieve their goals.

Key point to summarize: Inclusive education is about looking at the ways our schools, classrooms, and MT lessons are designed so that all children can participate and learn. Inclusion encourages us to understand what hinders the education of some students and find different ways of teaching so that classrooms actively involve all children. It also means finding ways to develop friendships, relationships, and mutual respect between all children.

Pictorially, these classifications of schools can be represented as follows¹:

¹ Picture courtesy of So'Lille (<https://handicampus.univ-lille3.fr/scolarite/>)

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Challenges to implementing inclusion

Trainer: Read and summarize the following for participants:

Inclusion is about identifying the barriers that hinder students with disabilities from receiving the same education as their peers without disabilities. Later, we will discuss the barriers that students with LV or who are HoH face and how to accommodate them in the classroom. For now, I want to know the current challenges you have when trying to implement inclusive education.

Trainer: Ask participants to share what they believe are the challenges to teaching students with disabilities in the classroom. Write the challenges mentioned by the participants on a piece of flip chart paper for all to see.

These are the barriers mentioned in Ethiopia's *Education Sector Development Program IV*. If there are items from the list below that are not mentioned by the teachers, present them to the participants and ask them if they have anything to share about these challenges:

- limited understanding of the concept of disability
- resistance (from, e.g., teachers, principals, and parents) to change
- insufficient opportunities for teacher training
- negative attitude toward disabilities
- rigid and poor teaching methods
- inconvenient learning environments
- limited access to formal education by children with special needs
- lack of collaboration between the Ministry of Education and partners

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- limited resource centers
- inadequate assessment procedures.

Once teachers have responded, walk them through the list and ask them to share how they believe they can overcome each of the barriers they have listed. Prompt them to elaborate on what they believe they can do and what forms of assistance they may need to overcome these challenges.

Write the stated solutions on a different piece of flip chart paper (preferably in a different color). Place the flip chart papers presenting perceived challenges and possible solutions side by side on a wall in the room for all to see.

Benefits of inclusion may include:

- Varied approaches to learning
 - Differentiated instruction or presenting the information in various ways (e.g., visual, auditory, and kinesthetic) allows opportunities for all students to learn in the way that is best for them.
- Higher standards
 - When students with disabilities are included in the same classes as their peers without disabilities, they are expected to complete the same work. Students with disabilities are held to higher expectations than they would be in separate classrooms with only students with special needs. Children with and without disabilities learn with and from each other in inclusive classes.

Thoughts and reflections

Divide the teachers into groups of four. Teachers from the same school should be in different groups. Within the groups, ask them to share their experiences of having children with disabilities attending their schools. Present the questions below for teachers to discuss within their groups:

- What kind of education is occurring at your school? Is it inclusion, integration, segregation, or exclusion? Provide examples from your school to support your answer.
- What are the benefits of teaching students in inclusive classrooms?

After 10 minutes of discussion, ask teachers to report what was discussed in their group. Write the benefits mentioned by the teachers on a piece of flip chart paper for all to see. Make sure that the benefits listed below are mentioned.

- Social inclusion
 - When children interact and attend classes that reflect the similarities and differences of people in the real world, they learn to understand and appreciate diversity. Respect for diversity creates a welcoming environment for all. Schools are important places for children to develop friendships and learn social skills. It is expected that this understanding of diversity will transpire from the school to the community the students live in.

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- Parental involvement
 - Inclusive education encourages the involvement of parents in the education of their children and the activities of their local schools.
- Positive self-esteem
 - Exclusion of any kind typically has a negative impact on a person’s emotional state. Students with disabilities who are included in class are more likely to feel accepted and welcomed by their peers, which will boost their self-esteem and confidence.

Introduction to ATCBI (45 minutes)

By the end of this session, participants should be able to:

- Explain the purpose of ATCBI
- Define LV and HoH

Trainer: Read and summarize the following information for participants:

Reading for Ethiopia’s Achievement Developed Technical Assistance’s (READ TA’s) ATCBI aims to support the systematic implementation of the revised curriculum for reading and writing in MT in Ethiopia. The ATCBI is intended to build the capacity of teachers in using assistive technology (AT) to screen, identify, and support students who are HoH and students who have LV, in support of Ethiopia’s inclusive education policies and strategy. In addition to increasing knowledge on AT devices, the initiative will provide teachers with methods and pedagogical skills to accommodate diverse learners.

Target Groups for AT Intervention

Background information to be summarized and explained to the participants:

Determining the number of students with special needs in Ethiopia can be a challenge because of the lack of proper identification mechanisms. Often, students are identified by their physical characteristics or behaviors, which can be misleading. While identifying students with severe impairments (e.g., who are blind or deaf) is fairly easy, it is particularly difficult to identify and accommodate students who have partial hearing or vision loss; therefore, the educational needs of these students are not always met. Using the hearing and vision screening apps on your device, READ TA conducted a screening of over 3,700 students. It was determined that there were 367 cases (9.85%) of students with an HI and/or VI.

LV

For the purposes of this manual and to reduce confusion, it should be stated to the participants that a person with LV is not blind but has vision that is considered impaired. LV can be corrected with eyeglasses. However, many students do not have access to eyeglasses and need accommodations in general education classrooms. The light in the classroom, location of chalkboard, size of the text written on the chalkboard, placement of the student in the classroom, size of the text in the book, and types of materials students use to complete written activities may impact the education of a student with LV.

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The screening conducted by READ TA in December 2016 was for distance vision only and identified a child as possibly visually impaired based on a LogMAR Score/Snellen value of 0.3 or greater.

Students who have **functionally LV** use a combination of visual (large print), auditory (audio books), and tactile (braille) modes to acquire information. In the absence of individual glasses, these individuals may best be helped with LV devices, such as large print, magnifiers, and illumination, if available.

HoH

A student who is HoH but not deaf has an HI that interferes in the processing of linguistic information and adversely affect communication, developmental skills, academic achievement, vocational career skills, or social-emotional adjustment. Not all levels/severities of hearing loss will affect a student's ability to learn. However, children who are HoH may find that it is difficult to learn vocabulary, grammar, word order, idiomatic expressions, and other aspects of verbal communication. Classrooms can also be noisy, which interferes with all children's performance. The noise may particularly affect the speech and understanding of children with hearing loss.

For the purpose of the screening conducted by READ TA in December 2016, a child was identified as possibly having an HI if they showed a 35-dB loss (mild loss) or higher on one or more of the frequencies tested (1,000 Hz, 2,000 Hz, and 4,000 Hz) and in one or both ears. The hearing screening was very sensitive to background noise. The screening tool captured significant levels of background noise during many of the screenings conducted; thus, the results of this screening need to be considered with care.

Trainer: Please emphasize the following:

The vision and hearing screenings conducted by READ TA **are not medical diagnostic tests** but initial screenings with the purpose of referring children to a medical doctor for specialized diagnosis and treatment as needed. For all children identified as having a potential impairment during the screening, the school was given written notices to send to and inform their parents of the result of the screening and encourage them to seek an appropriate medical examination.

An example of the referral can be found in Appendix A of this manual. **Trainer**, make enough copies so that one can be distributed to each participant before the training. During this activity, read through the referral with the participants and ask them if there are any questions.

Tea Break (30 minutes; 10:30–11:00 am)

Please advise teachers to return promptly after 30 minutes

Introduction to Smartphones (45 minutes)

By the end of this session, participants should be able to:

- Perform basic functions, as listed in the manual, on their AT smartphone

Trainer: Give each participant an ATCBI smartphone. Use the phone manual found in Appendix B to guide participants on the basic use of the phone. Note that the items in the 'Training Progress Self-Reflection' checklist at the end of the manual are of the utmost importance and should be highlighted.

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In addition, communicate to teachers the importance of not deleting the essential apps (e.g., mHealth studio and IMLP). **Trainer**, please demonstrate how to cancel the process before completely deleting an app. To demonstrate this process, start by holding your finger on an application on the phone. Instruct the participants to press the back button when this happens to stop the deletion. Additionally, show them that if they press the 'X' on one of the apps, a prompt will be displayed. This is the last step before deleting the application. Read the prompt to the participants—"Do you want to uninstall this app?"—in English and the MT. Inform them that they will press 'Cancel' (**not** 'OK') to prevent the app from deleting. Ask if there are any questions.

Screening Demonstration (45 minutes)

Trainer: Use the screening PowerPoint slides to provide step-by-step instructions on how to use the PeekVision and hearScreen applications. Have the teachers follow along using their phones as you proceed through the slides. After one step-by-step demonstration, perform a demo of each screening. Conduct the vision screening first, directly followed by the hearing screening.

Lunch (12:30–2:00 pm)

Please advise teachers to return promptly at 2 pm

Screening Practice (1 hour and 15 minutes)

By the end of this session, participants should be able to:

- Locate mHealth on their phones and log in with minimum assistance
- Demonstrate the hearing screening and associated functions (e.g., connecting headphones) with minimum assistance
- Demonstrate the vision screening with minimum assistance
- Manage the classroom assessment summary sheet

Ask teachers to find a partner, preferably from their school. Provide them with all of the materials needed for screening (i.e., phone, headset, paper with large E, assessment summary sheet, and string). Tell participants to take turns practicing the screening. Each participant is expected to perform at least five repetitions of each screening (vision and hearing) and practice writing the screening results on the classroom assessment summary sheet (example found in Appendix C).

Walk around the room and provide support as needed. After 30 minutes of practicing, ask participants to shut their phones off. Once all phones are off, tell them to turn their phones on, find the screening app on their phone, and continue practicing the screening. Assist those who need help turning the phone on or locating the app.

Tell participants to find a new partner. Allow the new pairs to continue screening for 30 minutes. Then, ask them to log out of the app, turn the WiFi Internet off, and shut down the phones again. This time, when the teachers turn on their phones, ask them to open mHealth studio and log in. They will need to reconnect to the Internet to do so. Write the user email (READ TA created one per region) and password on a flip chart and place it in the front of the room for all to see. Instruct them to type this information, exactly as it is written, into their phones. Assist any teacher who needs help

logging in. If the headphones need to be reconnected, use the information (i.e., scanning the serial number of the headset or typing it in) from the PowerPoint to do so.

Screening questions and reflection (15 minutes)

Ask the teachers if they have any questions or remarks about the screening. Ask them to identify the easiest part of the screening and the challenging parts. Discuss the ideas and solutions the participants come up with.

Tea Break (30 minutes; 3:30–4:00 pm)

Please advise the teachers to return promptly after 30 minutes

Recap on the New MT Curriculum (1 hour)

By the end of this session, participants should be able to:

- Understand the importance of MT education
- Explain the gradual release model

All teachers participating in the ATCBI have received a 10-day training on the new MT curriculum. Therefore, this session should be a brief review of the MT curriculum to highlight its importance and benefits.

What do we know about MT instruction?

Note: The following information is included in the syllabus for each grade level, which is found in the back of the teacher's guide. For this activity, provide participants with the guide and ask them to turn to this section in their book. Divide the participants into small groups (three–four people each). Have each group read a different paragraph and be prepared to share the essential points of the paragraph; multiple groups can read the same paragraph. Allow 10–15 minutes for reading and group discussion. Walk around the room to provide clarity about the text when necessary.

From the teacher's guide:

Reading refers to the ability to integrate the knowledge of symbols and sounds in a certain language and to use this knowledge to make meaning from print. Reading helps students to process information and to develop meaning out of it. Writing involves communicating ideas and information to others through print. Without developing students' basic abilities in reading and writing, they will have difficulty learning effectively in all subjects. Children become successful in schooling when they are able to understand lessons by developing the abilities to listen, speak, read, and write and when they are able to express their ideas in oral and written forms. Mastering the ability to read and write enables individuals to learn both in school and out of school, empowering individuals to manage their personal affairs and promoting their human dignity.

The easiest way for students to learn to read, understand, and communicate is when language instruction begins in the students' MT because students come to school with a basic oral vocabulary in their MT and can communicate very well in that language. Once students master their reading and writing skills in their MT, they can transfer those skills when learning another language. For these reasons, it is very important that students develop strong speaking, listening, reading, and writing

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skills in their MT in their first few years of school. Research has demonstrated that this allows students to learn core concepts primarily in a familiar language, laying a foundation for learning the labels or symbols of print.

Recognition of the importance of reading and writing and understanding the core components of reading and writing were taken into account in the development of the curriculum. In addition, the following assumptions were made: A.) the language is the instrument of instruction (learning and teaching), B.) students speak the language, and C.) students may not come to Grade 1 with adequate pre-reading skills. By receiving instruction from teachers who are skilled in evidence-based practices for teaching MT skills, students will be able to develop their communication skills, both oral and written; develop their ability to understand written and oral information; develop their ability to use the language correctly in speaking and writing; and enhance their awareness of a variety of written materials.

Reflections

After 10–15 minutes, present the following questions:

- How many of you learned to read and write first in your MT?
- How has that influenced your literacy journey?
- What does research indicate about the benefits of MT instruction?
- For each group, what did your paragraph say about MT learning?

I do, We do, You do: Gradual Release Model

Trainer: Explain to the participants that the ‘I do, We do, You do’ model is the instructional approach used in the revised MT reading and writing curriculum and can be found throughout the teacher’s guide. This technique is very effective for both teachers and students.

I Do... The teacher models the skill.

We Do...The teacher and the students practice the skill.

You Do...The students practice the skill independently, with specific teacher feedback.

Trainer: Select a blending or segmenting activity in the IMLP to provide a brief example of I do, We do, You do. Take 10 minutes to properly demonstrate the activity. Once finished, ask teachers:

- What are the benefits of this type of teaching model for teachers?
- What are the benefits of this type of teaching model for students?
- How might this strategy help students with LV or those who are HoH? [Expected answer: Students with LV or who are HoH may miss key information during the lessons if the information is only stated once. However, if teachers use the gradual release model, LV and HoH students have multiple opportunities to grasp the information.]

Open a new blending or segmenting activity in the IMLP. Ask for a volunteer to come to the front of the room and demonstrate the gradual release model. Repeat with three other teachers. Discuss the modeling and any resulting participant insights.

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Day 2

Recap and Reflections of Day 1 (30 minutes)

Trainer: Welcome the participants and present the following:

- What is the difference between inclusion and integration?
- Name two benefits of inclusive education.
- What are two barriers to inclusion, and how can you overcome them?
- Ask one participant to come to the front of the room and show how to transfer an app using Xender.
- Ask one participant to come to the front and demonstrate how to perform a vision screening.
- Ask one participant to come to the front and demonstrate how to perform a hearing screening.
- What are two benefits of MT instruction?
- Who can explain the gradual release model and why we do it?

Provide clarification or corrections as necessary.

Accommodations (1 hour and 15 minutes)

By the end of this session, participants should be able to:

- List and explain accommodations in their own words on the accommodations worksheet
- Demonstrate two accommodations

Trainer, read and summarize the following for the participants:

The IMLP is an accommodated, electronic version of your newly revised MT teacher's guide. In the IMLP, you can find accommodations specific to the activities within the lesson each day. It is important that we all have a common understanding of the accommodations to properly implement them in class. (Provide the participants with the accommodations worksheet in Appendix D.)

Warm-up: Pair and share

Ask the participants to find a partner and discuss the following questions for 5 minutes:

- Name two challenges that students who have LV may face when learning in an inclusive classroom. What can we do help them?
- Name two challenges that students who are HoH may face when learning in an inclusive classroom. What can we do help them?

Encourage three–four participants to share their answers.

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Once explanations are complete, thoroughly explain the following chart to participants. It is suggested that this information be provided on a PowerPoint for teachers to see and that teachers should write notes on their accommodations worksheet.

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What should we do?	How and why do we do it?	Example from the accommodation guide	Disability focus (VI, HI, or both)	Questions or suggestions for the trainer to present to the participants after the description
Accommodations				
Change the environment to accommodate students with disabilities in the classroom	<p>Placing students with HI in the front of the room can assist them in better hearing what the teacher is saying.</p> <p>Placing a student with VI closer to the board in an environment that is uncluttered and easy to maneuver in will help them see the room and access spaces in the classroom. Students can also be placed near a peer who can provide support when needed.</p> <p>Students who are HoH can be placed in circular seating arrangements during some activities to allow them to see all students and attempt to read lips if necessary.</p>	<p>The IMLP may mention the following in red:</p> <ul style="list-style-type: none"> • seating arrangements • circular seating arrangements for group activities 	Both	<p>Suggestion:</p> <p>When placing students with LV in the front of the classroom, also consider the lighting. Make sure that they are sitting in a well-lit area.</p>
Provide additional time (for assignments and assessments). Allow extra time for students with disabilities to respond.	Students who are HoH and who have LV typically require additional time to process request before responding.	<p>The IMLP may mention the following in red:</p> <ul style="list-style-type: none"> • "Give LV and HoH students to respond about their reading comprehension." • "Give LV and HoH students a chance to respond to questions." • "Provide a few more minutes for HoH and LV students." 	Both	<p>Question:</p> <p>Do you believe it is possible to provide students with additional time during the lesson? Why or why not?</p> <p>If the participants say "no", ask them if they/their school could make time after school hours to provide support or give additional time for students who need it.</p>

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What should we do?	How and why do we do it?	Example from the accommodation guide	Disability focus (VI, HI, or both)	Questions or suggestions for the trainer to present to the participants after the description
<p>Allow students to respond in various ways.</p>	<p>All students should have the opportunity to process/respond in the way that meets their needs: verbally, in writing, by pointing to the correct answer, and/or by choosing the correct manipulative.</p>	<p>The IMLP may mention the following in red:</p> <ul style="list-style-type: none"> “Ensure that everyone is involved in the answer.” 	<p>Both</p>	<p>Question: Who is more likely to prefer to respond verbally?</p> <ul style="list-style-type: none"> Possible answer: Typically, students with LV but could be students with mild to moderate HI, depending on their speech capabilities. <p>Question: Who is more likely to prefer to respond in writing?</p> <ul style="list-style-type: none"> Answer: Typically, students who are HoH. However, remember that many of these students are just learning to read and write. Therefore, you may have to assist them in writing their answers correctly. <p>Question: What is a manipulative?</p> <ul style="list-style-type: none"> Answer: A concrete item that can be used to support a concept, idea, or activity in the classroom. For example, if you are discussing water in a story, you can bring in a bottle filled with water as a manipulative.
<p>Secure students’ attention or alert students when presenting key points.</p>	<p>Students with LV may be trying to process large amounts of audio inputs during a lesson or classroom activity. It would be helpful to indicate the most important points so that they can focus on that information. Students who are HoH may require visual redirection (e.g., by waving hands or tapping</p>	<p>The IMLP may mention the following in red:</p> <ul style="list-style-type: none"> “Provide visual and oral signals to secure students’ attention or alert students of important points.” 	<p>Both</p>	<p>Question: What do you think is the best way to gain the attention a student who is HoH in your classroom? Answer: Wave hands, tap desk, clap hands, etc.</p>

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What should we do?	How and why do we do it?	Example from the accommodation guide	Disability focus (VI, HI, or both)	Questions or suggestions for the trainer to present to the participants after the description
	the desk) to focus their attention on important messages in lessons/activities.			
Speak in a clear, loud, and unobstructed manner during lessons.	This will provide the class with information that is loud and clear. It is extremely helpful for students with LV because their lack of vision makes them heavily dependent on audio input in the classroom. Students with HI may try to read lips, so it is important that teachers are facing the room while speaking. Also make sure that nothing is covering the teacher's mouth/face when speaking. In addition, teachers may be referring to a specific word or sentence on the board. If the teacher is pointing while speaking towards the class, VI and HI students will benefit.	The IMLP may mention the following in red: <ul style="list-style-type: none"> “Face the class while speaking.” 	Both	Note to teacher: If you notice that you often talk while you are writing on the board, try to write in segments. Write a couple of words or a sentence and then stop to say what you would like to say while facing the class. Continue this pattern until all information is written.
Speak clearly and slowly.	Similar to the reason above. It is important to speak clearly and slowly so that students with LV can follow.	This accommodation is often stated in the weekly objective.	Both	Note to teacher: Your speech should not be over-exaggerated in a manner that is confusing to students, especially to HI who may be attempting to lip read. The goal is to not speak too quickly or abnormally slowly.
Provide audio accommodations.	This is one of the main tools in the ATCBI. The teachers will be provided with mobile devices that include audio segments of key lesson activities.	This accommodation is seen during blending, segmenting, and listening exercises.	This can be used for LV and HoH students, if volume on the audio devices is loud enough or if headphones are provided for students	Note to teacher: It would be most helpful to place HoH/LV students near each other if you let them use the headphones for the audio playback. Students can then pass the technology among themselves, which

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What should we do?	How and why do we do it?	Example from the accommodation guide	Disability focus (VI, HI, or both)	Questions or suggestions for the trainer to present to the participants after the description
			who can hear and distinguish what is being said.	will limit distraction among peers who are not using the device.
Provide continuous assessment and frequent feedback along with praise.	Continuous assessment and feedback are great for all students, including those without disabilities. These activities help teachers identify trouble areas before moving on to a new topic.	The IMLP may mention the following in red: <ul style="list-style-type: none"> • "Provide frequent feedback and praise." 	Both	Notes to teacher: If you ask a question and the student provides an incorrect answer, correct the student in a positive and helpful manner. Students with disabilities may be hesitant to speak up in class. Even if a student provides an incorrect answer, thank them for trying to keep them encouraged to try again later. During a 'You Do' activity, walk around the room, listen, and look at students' books (those with disabilities and those without) to ensure that they are understanding the activity. Correct as needed. If this is a written activity, and a student with an impairment is struggling to write, you can assist them with writing or allow them to respond verbally.
Provide oral and written directions.	Because the initiative focuses on students with different capabilities, it would be helpful to all students if key instructional directions were both written and spoken. Directions should also be repeated multiple times to ensure understanding for all students.	This accommodation is usually seen on the weekly objectives page of the IMLP.	Both	Note to teacher: Make sure that the written directions are in large print.

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What should we do?	How and why do we do it?	Example from the accommodation guide	Disability focus (VI, HI, or both)	Questions or suggestions for the trainer to present to the participants after the description
<p>Repeat directions, comments, and questions asked by other students.</p> <p>**This should include saying the name of the student when repeating his or her comments</p>	<p>Repeating information provides clarity to all students. It can assist students who have an HI if they are unable to hear a student who is far away from them.</p> <p>Repeating the name of the student can assist a student with LV by providing them with a better understanding of who is speaking and what is being said.</p> <p>This clarity may result in better understanding for all students, which may lead to increased participation.</p>	<p>The IMLP may mention the following in red:</p> <ul style="list-style-type: none"> “Repeat the comments and questions of other students.” 	Both	<p>Note to teacher: If possible, try to stand near the HoH student when repeating a question or answer provided by another student.</p>
Utilize peer support	<p>If possible, students can have a helper in the class who can repeat items that are missed or that s/he cannot see on the board.</p> <p>Regularly change helpers to give all children the chance to work more closely with a peer;</p> <p>Consider other peer activities in your classroom to avoid singling out students with an impairment; these activities are a great way to promote engagement among all students.</p>	Not specified in the IMLP but peer support can be used in lessons every day.	Both	<p>Question: Has anyone tried pairing a student with a disability with a peer? How did that work in your class?</p>

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What should we do?	How and why do we do it?	Example from the accommodation guide	Disability focus (VI, HI, or both)	Questions or suggestions for the trainer to present to the participants after the description
VI/LV-specific Teacher Behaviors				
Write in large print on the board	Students with LV may be able to see large print information written on the board. If not, they can come to the board to see the information.	This accommodation can be found throughout the IMLP.	VI	Note to teacher: The large size depends on the size of your chalkboard. Do not write so large that you have to erase and write more after one or two sentences. This will take much of your teaching time.
Provide bold-lined paper	Wide, dark-lined paper provides students with LV with a clear area to write in and allows them to write larger. If students cannot see the original lines on the paper, they may write in a disorganized manner. Thus, it will be difficult for the student to review his/her work or for you to provide continuous assessment if you cannot read what is written.	This accommodation can be found throughout the IMLP.	VI	Note to teacher: Bold-lined paper can be made by using a pencil, pen, or marker to shade every other line.
Provide picture accommodations	There are tasks in the student book that ask for students to describe a picture and predict what will happen in the accompanying story. Students with LV may struggle with this task. Teachers (or peers) can describe the picture or repeat and summarize the descriptions provided by students. The picture can be enlarged for some students who have LV to see, depending on the severity of their VI. Similar to above, tactile or real examples can be provided to the student.	The IMLP may mention the following in red: <ul style="list-style-type: none"> “Support LV students to understand the picture.” 	VI	Trainer: Present a slide with a picture on it or show a picture from the book to the participants. Ask for a volunteer to describe the picture.

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HI/HoH-specific Teacher Behaviors				
Behavior	Why?	Example in accommodation guide	Disability Focus (VI, HI or Both)	
Incorporate visual accommodations	Visuals can help students who are HoH understand words and concepts or make sense of key elements in stories.	The IMLP may mention the following in red: <ul style="list-style-type: none"> “Show color card to HoH students.” 	HI, but if the visuals are large enough, they can also benefit some of the students with LV.	Question: Can anyone tell of a time when they used visuals to help students understand something in a story or activity?

Accommodations Activity (15 minutes)

Trainer: Place the participants in groups of three. Read the following scenarios to the group two times, pausing for a few seconds. Give them two minutes to decide which accommodations they believe they will provide for each scenario and create an example to share with the group. Ask the participants to raise their hand and provide their answers. When each answer is presented, repeat it to the group along with the name of the person who said the answer. If the answer is incorrect, work with the participant to achieve the correct response, and thank them for their effort.

- 1) Today, you are reading a new story with your students. The lesson asks for students to look at the picture and predict what will happen in the story. What can you do to help students with LV in your classroom?
 - a. Answer: Photo description. *Ask participants to provide examples.*
- 2) After screening, you have identified two students with LV and one who is HoH in your classroom. Two of the students are sitting in the back corner, and one is sitting in the middle of the classroom. What do you do?
 - a. Answer: Move student to an ideal area or the front of the classroom. *Ask a participant to show you where this would be in the room you are in right now. The place should be well lit and in front of the flip chart/board or where you are standing.*
- 3) The students are currently doing a 'You Do' activity that requires them to write in their notebook. As you walk around the room to do a continuous assessment, you notice that your LV student is writing diagonally down the page and outside of the lines. How can you assist the student?
 - a. Answer: Bold-lined paper. *Ask a participant to show their example of bold-lined paper to the rest of the class. Make sure that every other line is bold and clear enough to write on.*
- 4) You are writing three words for segmenting on the board in large print for all to see. Once you finish writing the words, how will you say them to the class?
 - a. Answer: Clearly, loudly, and with your mouth unobstructed. *Ask a participant to come to the flip chart and demonstrate. Make sure that the participant is not talking while facing the flip chart. After s/he says the first word, ask the participants in the back of the room if they can hear him/her.*
- 5) I have demonstrated two accommodations throughout this activity. Who can tell me what they were?
 - a. Repeated directions (for each scenario) and repeating the name of the participant along with the response.

Tea Break (30 minutes; 10:30–11:00 am)

Please advise teachers to return promptly after 30 minutes

IMLP Explanation and Walkthrough (30 minutes)

By the end of this session, participants should be able to:

- Understand the purpose of the IMLP
- Recall the features of the IMLP
- Locate the IMLP app, open it on their phone, and access the desired lesson

Trainer: Explain to the participants that they will now see the accommodations discussed this morning in action. The IMLP is an accommodated version of the teacher’s guide they currently have at their schools (show a copy of the new teacher guide in your given MT). The IMLP was developed to support and help them create practical knowledge about how to teach students who are HoH and students who have LV. Tell them that they are now expected to put their printed books aside and only use the IMLP when they teach.

Features of the guide:

- Instruction support on specific accommodations for LV and HoH are written in red for daily lessons.
- Audio-embedded files are placed in areas where blending, segmenting, and listening activities occur each day.
- Integrated snapshots from the student textbooks for each week’s lesson have been added to facilitate teaching off of the smartphone device to avoid having to switch between electronic and printed resources.

Trainer: For the walkthrough, use the steps under “**IMLP APPLICATION**” in the phone guide found in Appendix B. The purpose of this walkthrough is to show the participants the IMLP icon, familiarize them with how to choose the lesson they wish to complete, and identify the accommodations and audio-embedded files.

After an initial walk through, ask the participants to select Week ___ [your choice] ___ and Day ___ [your choice] _____. Then, ask someone to read the accommodations on that page. Ask another person to locate the audio file (if applicable) on that page and imagine that the person beside him/her is a student who is HoH (i.e., play the audio file and put the phone to the ear of the person beside him/her or provide headphones). Do this with three different lessons. Make sure that the participants press the ‘Lesson Completed’ button after each example.

IMLP Demo Lesson (45 minutes)

The trainer will present one full lesson demonstrating the new MT methodology, instructional accommodations, and use of the provided teaching aids. Say, “Everyone, please open your IMLP and select Week___ [your choice], Day_____ [your choice]. I would like you to role-play with me. Now you are going to be second grade students. I am going to pretend to be a second grade teacher. I will lead you through this lesson.” Give two people the role of a student with LV and one participant the role of a student who is HoH. Move them to the ideal location in the ‘classroom’ and provide accommodations as needed.

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IMLP Feedback (15 minutes)

Ask the teachers to say which accommodations they saw during the demo lesson. Ask the teachers if they noticed the gradual release model. Request feedback on how to improve the lesson. Discuss ideas and insights from participants. Gather ideas for additional/alternative accommodations.

Inform teachers that they will begin IMLP practice lessons after lunch. Ask for five–six volunteers to model/teach a lesson using the IMLP, discuss which week/day each will choose, and have them use the lunch break to prepare for their IMLP lesson demonstration.

Lunch (12:30–2:00 pm)

Please advise teachers to return promptly at 2 pm.

IMLP Practice (2:00–3:30 pm)

Each volunteer teacher will have 20 minutes to present a lesson using the IMLP (the trainer should keep time and kindly ask each demonstrating teacher to stop after 20 minutes). At the end of each teacher's presentation, the participants and trainer will give feedback/comments (the trainer should keep time to ensure that all volunteers are able to present; limit the discussion to 10 minutes, for a total of 30 minutes for each volunteer teacher's presentation).

Tea Break (30 minutes; 3:30–4:00 pm)

Please advise teachers to return promptly after 30 minutes.

IMLP Practice (4:00–5:30 pm)

IMLP practice will continue until the end of the day.

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Day 3

Recap and Reflections on Day 2 (30 minutes)

Present the following to participants and select different people to answer:

- Describe one accommodation. Tell when it is used and which students are more likely to benefit (select five people to answer).
- What is the purpose of the IMLP?
- What features does the IMLP include that are not seen in the MT teacher’s guide?

IMLP Practice (1 hour and 30 minutes)

IMLP practice will continue throughout the day. This session should allow time for four teachers to demonstrate a 20-minute IMLP lesson. Encourage teachers to also make and use teaching aids.

Tea Break (30 minutes; 10:30–11:00 am)

Please advise teachers to return promptly after 30 minutes.

IMLP Practice (1 hour and 30 minutes)

IMLP practice continues.

Lunch (12:30–2:00 pm)

Please advise teachers to return promptly at 2 pm.

IMLP Practice (1 hour and 30 minutes)

IMLP practice continues.

Tea Break (30 minutes; 3:30–4:00 pm)

Please advise teachers to return promptly after 30 minutes.

Training Wrap-up (30 minutes)

Say, “During the training, we have covered topics on integrating the use of AT and inclusive education strategies with the new MT curriculum. I would like to give you all the opportunity to ask questions or provide any final feedback. As a reminder, we have discussed inclusive education, challenges and accommodations for students who have LV and are HoH, the basic process of using the phone, using the phone to screen students for a potential VI or HI (remind participants that screening is not a medical diagnosis), the new MT curriculum, and the IMLP.” Give participants time to provide feedback or ask questions. After this is complete, thank them for coming. Make sure that everyone has signed the necessary documents to take phones and headsets with them.

Appendix H

Endline Assessment Protocol

**READ TA Assistive Technology Initiative
Endline Assessment Protocol
May 2017**

I. Purpose of the Assessment Protocol

Guide the data collection for the endline in schools to ensure the appropriate sequence is followed, and in the same way across schools and regions.

II. Purpose of the Assessment

Test assumptions about the experience that students with visual impairment (VI) and students with hearing impairment (HI) may have in mother tongue classrooms; and the experience their teachers have teaching them.

III. Scope of the Assessment

- 109 classrooms in 63 schools in 5 regions
- 1-1.5 days of data collection in each school (classroom observations, teacher interviews, student interviews, principal interview– ca. 4-4.5 hours)

IV. Assumptions

- Schools, classrooms, and sections have already been identified during baseline data collection
- School location lists have already been uploaded on Tangerine on the Nexus tablet
- There are some schools with one participating Grade 2 classrooms, some with two participating classrooms
- Assessor teams contain at minimum three personnel, indicatively made up of one READ TA staff (acting as team leader), one Tangerine experienced data collector, and one assistive technology working group member
- Each team has, in addition, three tablets for the classroom observation; teacher, student and principal questionnaire
- Each team has a list of identified HI/VI students in each of the classrooms
- Classroom Observations should take place first
- Student, teacher and principal interviews conducted with privacy
- Student interviews take about 15 minutes, not including transition times between children
- Classroom observations will take the entire duration (40 minutes) of a class
- Classroom observations will only be conducted for classrooms teaching reading and writing in Mother Tongue
- Teacher and principal interviews take about 20-30 minutes

V. Sequence of Activities at Each School

1. Introduction and welcome with principal
2. Review student list with teacher
3. Classroom observation for each classroom by all 3 assessors
4. Student interviews conducted by Tangerine-experienced assessor
5. Teacher interview and principal interview conducted by other assessors while student interviews are being conducted
6. Thank you and leave

5.1 Introduction and welcome

- Assessor team seeks out principal of school upon arrival
- Team introduces themselves, states the purpose of visit and explains the process
- Confirm that all participating teachers are present and will be teaching reading and writing in mother tongue that day

5.2 Review of student list

- For each of the selected classrooms, one assessor sits with the teacher and reviews the list of students with a VI/Hi identified during baseline, to determine if they are at school that day
- Ask the teacher to discretely identify the student
- Students identified with VI/Hi, who are not in the school anymore or present that day, are recorded on the School Overview sheet

5.3 Classroom observation

- Assessors decide who focuses on which child for the classroom observation. Each assessor will focus on one or two children identified with VI/Hi (depending on how many have been identified in this classroom).
- Consent for classroom observation and subsequent teacher interview and group discussion is sought from teacher in writing before observation starts.
- If consent is not given, thank teacher and replace classroom.
- For recording data from the classroom observation, assessors use the Tangerine app on the Nexus tablet.
- Assessors make sure to correctly enter the Baseline ID number of the children with VI/Hi they are responsible for, into the relevant fields in the Tangerine Classroom Observation instrument. Assessors do not enter the name of the child (keeping the student name out of the actual questionnaire and out of the database will help to ensure that the resulting analysis will remain anonymous).
- Assessors make sure to correctly enter the section identifier for the class section they observe
- Assessors observe the entire lesson of one classroom, all along entering observations into the Tangerine Classroom Observation instrument.
- If there are two classes in one school, when one classroom has been completed, assessor team observes the entire lesson of the other classroom.
- It is estimated that both classroom observations may take 1.5 hours together, with one being conducted right after the other.
- After each classroom observation has been completed, the assessor team supervisor marks the completion of the classroom observation on the School Overview

5.4 Student interview

- Following the classroom observation, all children identified with VI/Hi are being asked to participate in the student interview
- An equal number of children in each classroom, without VI/Hi, are also being asked to participate in the student interview. These children should be selected randomly from the

remainder of the class. These students do not have to be the same as those without VI/HI who were interviewed during baseline.

- To do this, the assessor counts the total number of children present from the student roll, then divide that number by the number of kids identified with VI/HI, e.g., $32/4 = 8$. Starting at a random child on the list, the assessor counts out every 8th child, and proposes this child for interview
- For the Student Interview Instrument, assessor uses the Interview instrument in the correct Mother Tongue language from the Tangerine app on the Nexus tablet.
- Assessor makes sure to correctly enter the ID number of the children to be assessed into the Student Interview instrument on Tangerine. Assessors do not enter the name of the child (keeping the student name out of the actual questionnaire and out of the database will help to ensure that the resulting analysis will remain anonymous).
- Assessor makes sure to correctly enter the section identifier for the child's class section
- Consent by the child is again sought for this activity.
- If child does not want to participate, assessor thanks the child and asks for next.
- If child consents, assessor will conduct student interview
- Once the child interview is completed, assessor thanks the child, marks the child's interview completed on the Classroom Assessment Summary, and asks for the next child.
- It is estimated that per classroom, this may take two hours.
- After completing all student interviews for each classroom, the assessor team supervisor marks the student interviews as completed on the School Overview.

5.6 Teacher and principal interviews

- Once classroom observations and student interviews are being conducted, assessors conduct an interview with the teacher of their classroom.
- Assessors use the Tangerine app on the Nexus tablet
- Assessors use the Teacher Interview instrument and records teachers' responses.
- Assessors makes sure to correctly enter the section identifier for the class section the teacher teachers
- Once the teacher interview is completed, assessor thanks the teacher and the assessor team supervisor marks the teacher interview completed on the School Overview.
- If there are two teachers in the school, both teachers are interviewed in parallel.
- If there is only one teacher in the school, the principal interview
- The third assessor conducts the principal interview, using the Principal Interview instrument in the Tangerine app on the Nexus tablet to record principal's responses.
- Once the principal interview is completed, assessor thanks the principal and the assessor team supervisor marks the principal interview completed on the School Overview

VI. Thank you and leave

- Once all classroom observations, student interviews, teacher interviews, and principal interviews have been completed, assessor double check the Classroom Assessment Summary and School Overview against the completed screenings and assessments one more time on their phones and tablets to confirm.
- Most importantly, the ID numbers of each child identified with a HI/VI should be the same in the classroom observation and student instrument.
- Thank everybody and leave.

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Appendix I

Intervention Stakeholder Analysis

Stakeholder Analysis: Improving inclusive education in Ethiopia									
Stakeholder (Role in Organization)	Program	Stake or interest in:	Needed from Stakeholder to Successfully :	Influence on:	Potential Issues with Stakeholder	Relative Importance of Stakeholder			
	Program	Evaluation	Implement Program	Conduct Evaluation	Program Success	Evaluation Success			
USAID Agreement Officer Representative	Program client, stake and interest in successful implementation of activity as it reflects also on USAID	Program client, stake and interest in program outcomes as they reflect also on USAID	Do not object	Do not object	High influence on program success as main person who could "stop" it.	High influence on program success as main person who could "stop" it.	Disinterest and prioritization of other project activities	High, gives legitimacy	
MOE Director, Planning	Alignment with relevant policies and other education and donor-funded programs in the country	No stake/interest, beyond general curiosity on findings	Read concept note and do not object; forward concept note and accompanying letters to Regional State Education Bureau (RSEB); forward other letters related to intervention activities to RSEB.	Read concept note and do not object; forward concept note and accompanying letter to Regional State Education Bureau (RSEB); forward other letters related to evaluation and dissemination activities to RSEB.	Limited influence on program success once initiative started	Limited influence on evaluation success once initiative started	Availability to send communication to regions in a timely manner	Moderate	
MOE Director, Special Needs	Promotion of inclusive education policy	Exploring tangible interventions that may make a measurable difference for children with disabilities	Read concept note and do not object; ideal would be attendance at key workshops (e.g., co-design workshops).	Read concept note and do not object; ideal would be attendance at key evaluation and dissemination events	Limited influence unless objects to initiative	Limited influence on evaluation success; but high influence in evaluation finding uptake and utilization	Availability; disagreement to narrow (sensory disabilities) program focus	Moderate	
MOE Director, Technology	Limited stake/interest, beyond general curiosity on how technology use	Limited stake/interest, beyond general curiosity on results	Read concept note and do not object; ideal would be attendance at key workshops	Read concept note and do not object; ideal would be attendance at key dissemination	No influence on program success	No influence on evaluation success	Availability	Low	
RSEB Heads from the five regions (Amhara, Oromia, Somali, Southern Nationalities, and Tigray)	Strong interest in implementation of inclusive education policy at regional level	Exploring tangible interventions that may make a measurable difference for schools in the region	Read concept note and do not object; assign staff to participate in the intervention; support activities of working group; ideal would be attendance at	Read concept note and do not object; assign staff; ideal would be attendance at regional dissemination event	High influence on program success as main person who could "stop" it.	High influence on evaluation success as main person who could "stop" it.	Availability	High; gives political legitimacy; enable future replication and utilization of results at regional level	
RSEB Special Needs Experts from the five regions	Strong stake in implementation of inclusive education policy at regional level; strong stake in implementing a successful intervention that principals and teachers value	Strong stake in implementing successful evaluation with credible results that may make a measurable difference on inclusion at schools in region and other RSEB staff at regional level; keep RSEB Head	Read concept note; actively participate in working group; actively participate in design and implementation of the activity; liaise with principals and other RSEB staff at regional level; keep RSEB Head	Read concept note; actively participate in working group; actively participate in research design, instrument testing, baseline data collection, monitoring visits, and endline data collection; actively	High influence on program success as main person with mandate for inclusive education at regional level	Moderate influence on evaluation success, but would be positive if actively engaged to generate ownership over findings and contribute to political legitimacy	Availability; capacity; level of influence with others in RSEB and region	High; get the working group implemented and sustained; drive future replication and utilization of results	
Regional working group members from DPOs and Colleges of Teacher Education	Strong interest in implementation of inclusive education policy at regional level and gaining capacity in process	Exploring tangible interventions that may make a measurable difference for inclusive education at the school level in the region and gaining capacity in the process	Read concept note; actively participate in working group; actively participate in design and implementation of the activity; liaise within own organizations to generate awareness	Read concept note; actively participate in working group; actively participate in research design, instrument testing, baseline data collection, monitoring visits, and endline data collection; actively participate in dissemination especially within own	Medium influence as individuals; but high influence as a group for overall success for the implementation of the program as a capacity building initiative	Medium influence as individuals; but high influence as a group for overall success of the implementation of the research as a capacity building initiative	Availability; capacity	Moderate, but give technical credibility	
READ TA Regional Gender and Inclusion Specialists (project staff)	Implementing the program in their region is a deliverable of their project position; personal reputation and learning	Implementing the evaluation in their region is a deliverable of their project position; personal reputation and learning	Mother tongue capacity; ability to lead regional activities and take responsibility for them; lead and motivate regional working groups	Mother tongue capacity for instrument development and data collection; ability to lead regional evaluation activities and take responsibility for them; lead and motivate regional	High influence as key person on behalf of the READ TA project in implementing the program on regional level	High influence as key person on behalf of the READ TA project in implementing the evaluation on regional level	Capacity; level of influence with regional stakeholders	Moderate, can be replaced, but would take time	
Participating school principals	Implementation of inclusive education policy at school level	Find out about tangible interventions that may allow the school to better fulfill its inclusive education mandate	Accept program to take place in the school; assign teachers; participate in training activities; support - or at least do not object - to teacher participation	Accept research to take place in the school; support data collections; participate in dissemination events	High at individual school level	High at individual school level	Limited interest in inclusion in light of competing priorities; availability to attend trainings; may demand personal use of devices, or otherwise obstructing teacher participation	Moderate from lens of overall program; but important during implementation when school was selected; important for sustainability and activity replication after READ TA project end	
Participating teachers	Providing quality education to all children; implementation of inclusive education policy at classroom level	Find out about tangible interventions that may allow the teacher to better fulfill the inclusive education mandate	Agree to take part in program; actively participate in trainings; implement intervention with fidelity	Agree to take part in the research; be constructive respondent in baseline and endline data collection and	High at individual classroom level	High at individual classroom level	Limited interest in inclusion; availability to attend trainings	High, to implement the classroom intervention; and for sustainability after READ TA project end	
Students in participating classrooms	Engaging and inclusive reading lessons; caring teacher; accelerated reading acquisition and inclusive reading lessons	Positive evaluation outcomes may encourage teacher and reinforce the delivery of engaging and inclusive reading lessons	Active participation in lesson	Agree to take part in data collection activities	High at individual level	High at individual level	High class absence	Moderate from lens of overall program	
Parents of students in participating classrooms	Quality (inclusive) education for their child	Positive evaluation outcomes may encourage teacher and reinforce the delivery of quality (inclusive) education	No direct needs for program, but ideally parent would take child for medical check up following referral	No direct needs for evaluation unless parent objects to child participation in the research	Low, unless they pull out child from classroom/school	Low	Not able to do or afford referral visit	Low	
READ TA Central Office (Gender and Inclusion Expert (project staff))	Implementing the program is a deliverable of this project position; personal reputation and learning	Implementing the evaluation is a deliverable of this project position; personal reputation and learning	Lead implementation of program activities especially related to inclusive multimedia lesson plan development and materials testing; teacher training manual development; implement teacher training	Lead implementation of evaluation activities especially related to instrument testing, instrument translation, enumerator training, baseline and endline data collection, and school monitoring	High as main implementation lead in-country	High as main evaluation lead in-country	Capacity	High, to get the activity implemented, would take time to replace	
READ TA IT Manager (project staff)	Supporting the program is a deliverable of this project position; personal reputation and learning	Supporting the program is a deliverable of this project position; personal reputation and learning	Procurement, testing, and preparing of smartphones and headsets; inclusive multimedia lesson plan development; technical support to teachers during implementation	Preparation of data collection tablets; technical support during baseline and endline data collection and monitoring visits	Moderate	Moderate	Availability	Moderate (can be replaced)	
Ethiopia National Association of the Deaf	Strong interest in implementation of inclusive education policy, and quality education in support of children with hearing impairments	High interest in tangible interventions that may make a measurable difference for children with hearing impairments	Active participation in key events; support in the development of lesson plan accommodation guide; liaise within own organization to	Actively participate in dissemination especially within own organizations	Low, unless they publicly reject the program	Low, unless they publicly reject the evaluation and results	Potential conflict of interest with association's other priorities, especially since program does not include children who are deaf	Low, but give technical credibility to program and evaluation if public supportive	
Ethiopia National Association of the Blind	Strong interest in implementation of inclusive education policy, and quality education in support of children with vision impairments	High interest in tangible interventions that may make a measurable difference for children with vision impairments	Active participation in key events; support in the development of lesson plan accommodation guide; liaise within own organization to	Actively participate in dissemination especially within own organizations	Low, unless they publicly reject the program	Low, unless they publicly reject the evaluation and results	Potential conflict of interest with association's other priorities, especially since program does not include children who are blind	Low, but give technical credibility to program and evaluation if public supportive	
Other USAID actors or donor organization	Program funding agency; interest in quality implementations to promote agency policy on inclusive education	Program funding agency; interest in successful programs to promote agency policy on inclusive education	No specific need	No specific need	Low; no direct influence on success of program implementation; moderate influence over awareness raising on activity through intra-agency collaboration and sharing	Low; no direct influence on success of program evaluation; moderate influence over dissemination of results through intra-agency collaboration and sharing	Limited interest in program and evaluation in spite of agency mandate	Low, but high influence on potential replicability of intervention and research including outside of Ethiopia	
Other implementing organization actors and program designers	Promising inclusive education interventions that might be possible to adapt and replicate in other contexts	Quality program evaluations and instrumentation in the field of inclusive education that could be adapted and replicated in other contexts	No specific need	No specific need	Low; no direct influence on success of program implementation; moderate influence over potential for replication elsewhere	Low; no direct influence on success of program evaluation; moderate influence over potential for replication elsewhere	Limited interest in program and evaluation	Low, but high influence on potential replicability of intervention and research within and outside of Ethiopia	
Other researchers	Promising inclusive education interventions that might contribute to a better understanding of inclusive education in diverse contexts	Quality program evaluations in the field of inclusive education; new, relevant instrumentation that could be adapted and replicated in other contexts	No specific need	No specific need	Low; no direct influence on success of program implementation; moderate influence over potential for replication elsewhere	Low; no direct influence on success of program evaluation; moderate influence over potential for replication elsewhere	Limited interest in program and evaluation	Low, but high influence on potential replicability of intervention and research within and outside of Ethiopia	
Other educators	Promising inclusive education interventions that might contribute to improving inclusive education in own context	Intervention is supported by credible research	No specific need	No specific need	Low; no direct influence on success of program implementation; moderate influence over potential for replication elsewhere	Low; no direct influence on success of program evaluation; moderate influence over potential for replication elsewhere	Limited interest in program and evaluation	Low, but high influence on potential replicability of intervention within and outside of Ethiopia	

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Biography

Carmen Isabel Strigel was born on May 6, 1977, in Ravensburg, Germany. Strigel completed her undergraduate degrees in secondary school teaching (English, geography, and mathematics) and media psychology at the University of Education Weingarten (Pädagogische Hochschule Weingarten), Germany. While completing her undergraduate degrees, she spent over a year studying media and communication and mathematics at Växjö University, Sweden. Upon her return to Germany, she founded the international office at Weingarten University and was elected Germany's president of the Erasmus Student Network, one of Europe's largest student organizations. Following her graduation from Weingarten University, Strigel worked as a project administrator at the European Schoolnet in Brussels, Belgium. Strigel designed and managed innovative education technology initiatives engaging over 1,000 people in 30 countries and was instrumental in the organization of seminal education technology conferences in Europe, including EMINENT 2001 in Lisbon, Portugal.

In 2002, Strigel received a Rotary World Peace Fellowship and moved to Durham, North Carolina, USA, to study at the joint Rotary Peace Center at Duke University and the University of North Carolina (UNC) at Chapel Hill. Strigel graduated with a master's degree in education from UNC and a graduate certificate in peace and conflict resolution from the two universities in May 2004. During her time as a Rotary Fellow, Strigel completed a three-month internship at the United Nations Development Programme in Baku, Azerbaijan, supporting the development of the country's 2003 Human Development Report. Upon graduation, Strigel joined RTI International (RTI), a non-profit research institute headquartered in North Carolina, where she currently holds the position of Director, Technology in Education and Training. In 2013, while working full time, Strigel completed a 15 credit-hour online graduate certificate in leadership in technology integration from Johns Hopkins University, Maryland, USA. Three years later she

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joined Hopkins' Mind, Brain, and Teaching program to embark on her doctoral degree (EdD) in educational neuroscience.

At RTI, Strigel leads the design, implementation, and evaluation of international education technology initiatives in Africa, Asia, and the Middle East. Strigel spearheaded the development of game-changing technology such as Tangerine (<http://www.tangerinecentral.org>), which transformed the administration of large-scale early reading and mathematics assessments and sector diagnostics in Africa, Asia, and beyond. She also leads RTI's strategic investment efforts investigating video games and sensor technologies to enhance the quality and validity of cognitive assessments. Strigel is the author and co-author of dozens of technical reports and research publications on international education, with a specific focus on education technology and inclusive education. Illustratively, she co-authored book chapters on electronic data collection for early grade reading assessment in low resource contexts and on using technology for data-informed instructional decision making in classrooms in Kenya. Strigel also co-authored a number of articles, notably on the role of technology to improve reading outcomes in Kenya in the *International Journal for Educational Development* and on using cutting-edge technologies in assessing complex skills for the Brookings Institution. She also is the lead author on several literature reviews on technology and inclusive education. Strigel is a frequent presenter and keynote speaker on international education, technology, and inclusion for USAID, DFID, ADB, and other organizations and governments around the world.